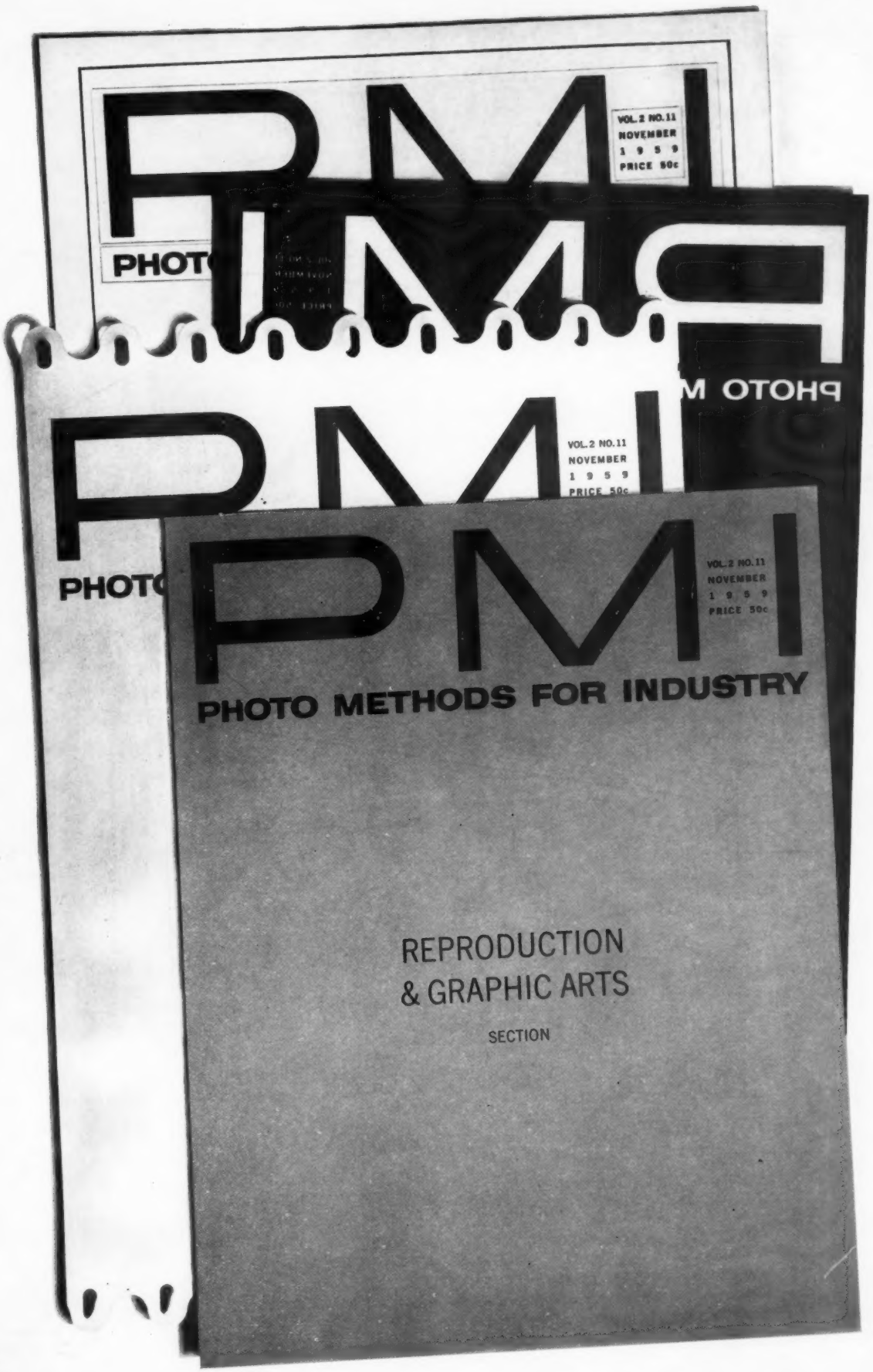
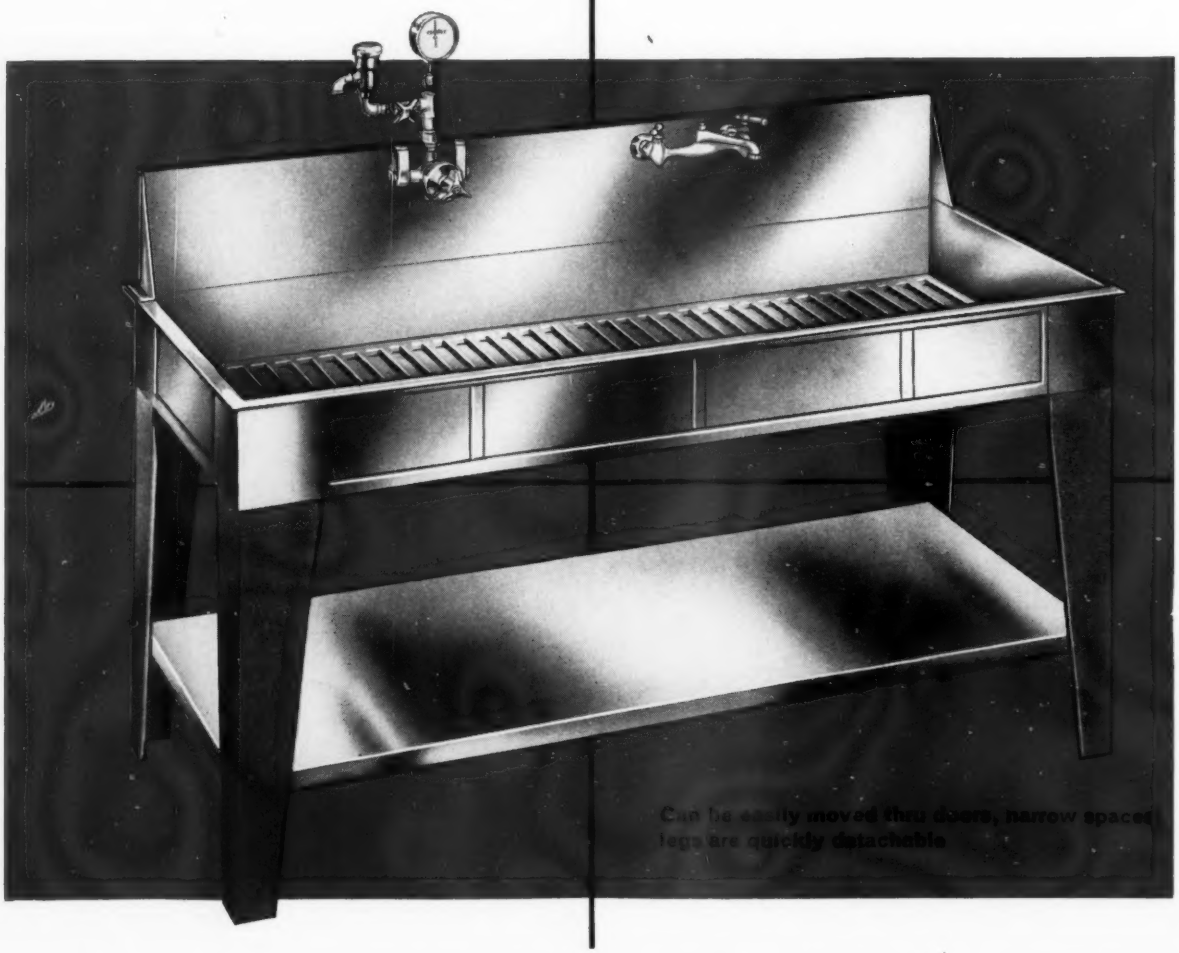

PMI
VOL. 2 NO. 11
NOVEMBER
1 9 5 9
PRICE 50c
PHOTO METHODS FOR INDUSTRY
REPRODUCTION
& GRAPHIC ARTS
SECTION

# Calumet SINKS represent HONEST VALUE

**Simple, functional, durable, these carefully built sinks give lasting service**



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**MANUFACTURING COMPANY, 6550 N. CLARK ST., CHICAGO 26, ILL.**

*Manufacturers of Cameras, Photographic Processing, Studio and Laboratory Equipment*


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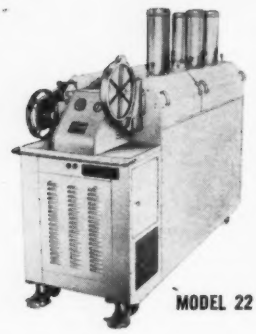

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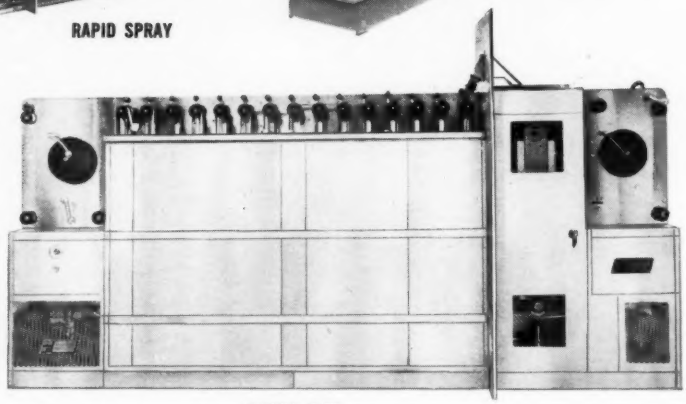

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|---|---|---|---|---|
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| 22 | 16mm | B&W | Reversal | 0 to 35 |
| 22B | 16mm | B&W | Neg. Pos. | 0 to 45 |
| Labmaster | 16mm | B&W | Reversal | 0 to 15 |
| Labmaster | 16mm | B&W | Neg. Pos. | 0 to 20 |
| Color Labmaster | 16mm | Color | Anscochrome | 0 to 15 |
| Color Labmaster | 16mm | Color | 7255 Ektachrome and Anscochrome | 0 to 40 |
| 100NPC | 16mm | Color | Eastman Neg. Pos. | 0 to 100 |
| 22BC | 16/35mm | B&W | Neg. Pos. | 0 to 22 |
| 120PN | 16/35mm | B&W | Neg. Pos. | 0 to 120 |
| RC-30 | 16/35mm | Color | Ektachrome Anscochrome | 0 to 30 |
| NP20C | 16/35mm | Color | Ektachrome Neg. Pos. | 0 to 20 |
| 45NPC | 16/35mm | Color | Eastman Neg. Pos. | 0 to 45 |
| S120PN Spray | 16/35mm | B&W | Neg. Pos. | 0 to 150 |
| 10C | 35mm | B&W | Neg. Pos. | 0 to 40 |
| 30NPC70 | 35/70mm | B&W | Neg. Pos. | 0 to 30 |
| P-70 | 70mm | B&W | Neg. Pos. | 0 to 20 |
| 20RC70P | 35/70mm | Color | Ansco Neg. Pos. Rev. | 0 to 20 |
| 20RC70M | 35/70mm | Color | Ektachrome Neg. Pos. | 0 to 20 |
| A-25 | 5"/9½" | B&W | Film & Paper | 0 to 18 |
| A-6 | 9½" | B&W | Film & Paper | 0 to 48 |
| DAC-20 | 21" | B&W | Ortho Pos. | 0 to 20 |

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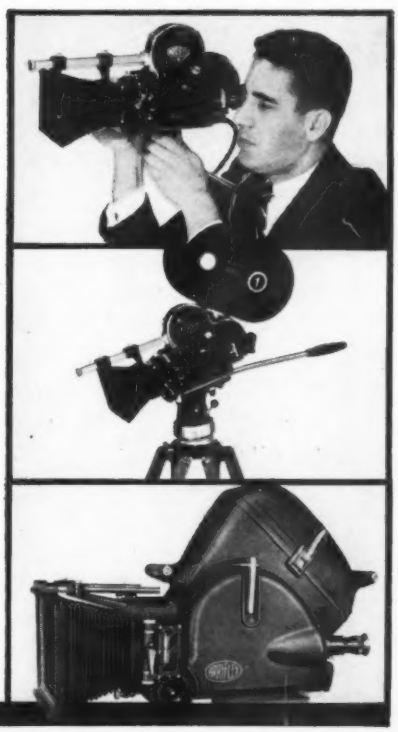

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**NOVEMBER, 1959**

**VOL. 2 NO. 11**

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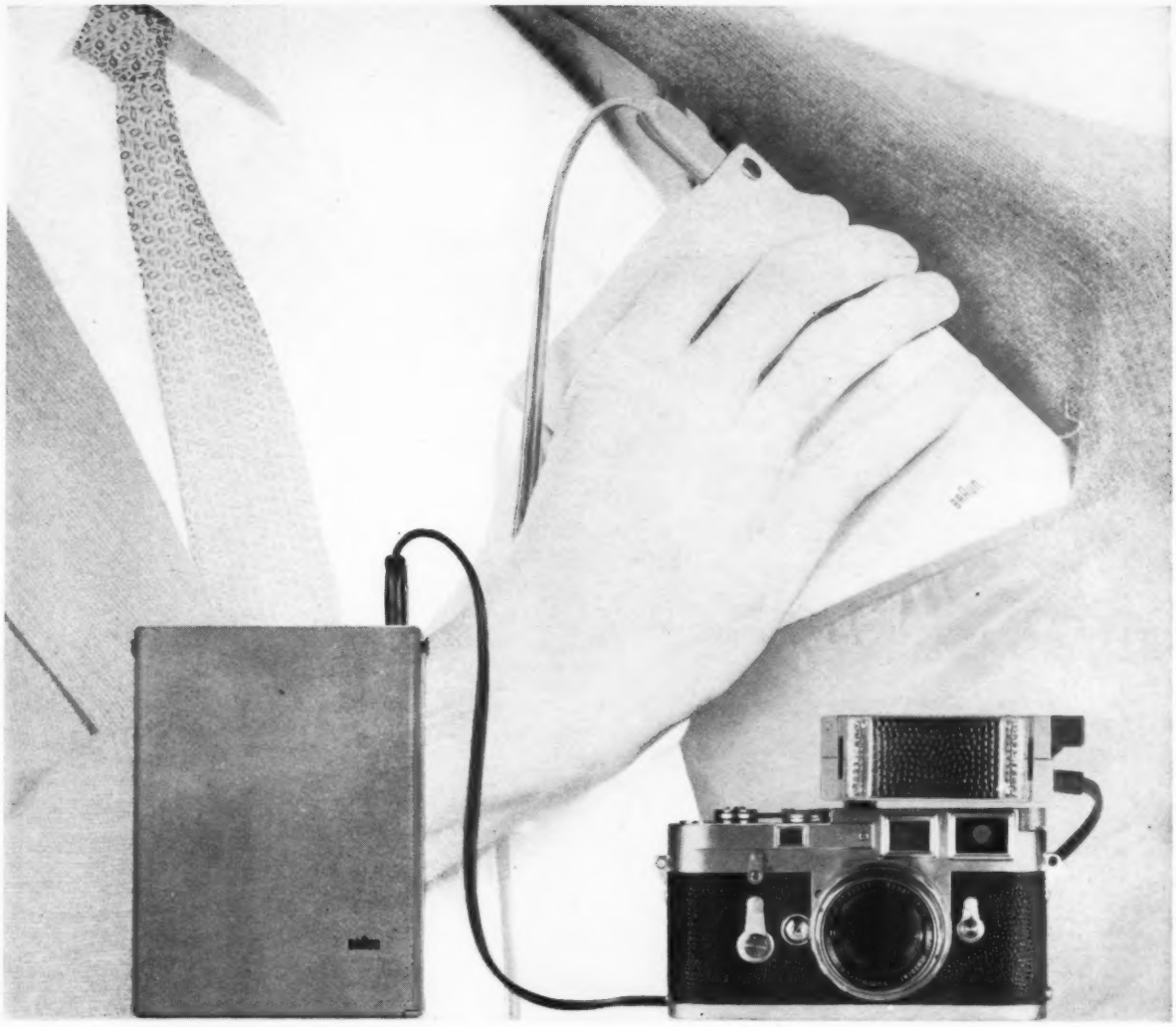

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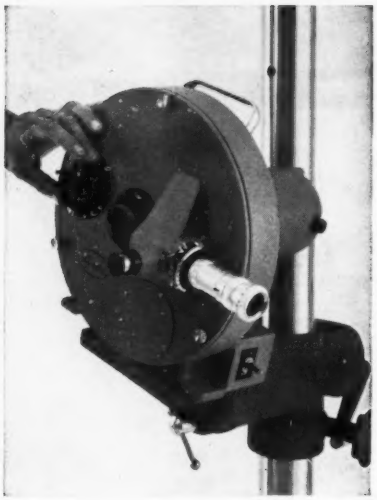

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# F.Y.I.

Fall brings with it chestnuts, football games, some welcome cool weather and convention honors. One of the more pleasant by-products of these gatherings, these honors are a way of telling people that their fellow workers, if not the general public, are ready to sing their praises. For the record, here are some of the honors of which we have been apprised.

**Among the honored guests . . .**

Among the 60 members of the Photographer Society of America honored at the PSA National Convention last month in Louisville, Ky., were: Donald McMaster, Chairman of the Executive Committee of Eastman Kodak and first (and only) American president of the Royal Photographic Society, named Honorary Fellow of PSA; M. M. Phegley, retiring PSA president, and Doris Martha Weber, noted pictorialist active in PSA for many years, named Honorary Members. Space does not permit the listing of each of the 15 who were named Fellows or of the 42 new Associates, but all of them have our sincere congratulations.

Moving north to New York, we find that the Society of Motion Picture and Television Engineers, in convention assembled, have made a number of awards. The Samuel L. Warner Gold Medal Award, to the engineer who has made an outstanding contribution to the recording and reproduction of sound motion pictures, went to Dr. John G. Frayne, retired Engineering Manager of the Westrex Corp. and a past president of SMPTE.

Derwyn Marland Severy, an associate research engineer at UCLA, received the SMPTE Journal Award for the most outstanding paper originally published in the SMPTE *Journal*. His paper, *Photographic Instrumentation for Collision Injury Research*, appears in the Feb. 1958 issue.

The Progress Award, highest honor of SMPTE, went to Dr. Harold E. Edgerton. Since any comment would be superfluous, we will just add our small voice to the chorus of congratulation.

SMPTE's Annual Student Award went to John Chestnut Stormont, a senior in the motion picture department at the University of Miami for his paper *Student-Built 16mm Continuous Positive Film Processor as Used in University Film Production*.

Fifteen men were honored with Fellow Memberships in SMPTE for outstanding contributions to the motion picture or television industries. The new Fellows are:

C. Loren Graham; James W. Kaylor; Harry Paul Brueggemann; Paul W. Vittum; Walter Beyer; Robert E. Birr; John M. Calhoun; Harry T. Ushijima; Han-Christoph Wohlrab; Julian Hale Webb; Philip E. Smith; Robert E. Gottschalk; G. Don Malkemes; Albert Gillet and Leon Shelly.

Each year, the Professional Photographers of America award a scholarship to Rochester Institute of Technology for the study of photography. The 1959-60 award went to 17-year old Joel Richard Kondreck of Belleville, N.J. The son of a professional photographer with a studio in Belleville, Joel not only worked for his father after school but covered news and sports for local papers. In 1958, he graduated from the commercial Photography Course at Winona School of Photography.

**The early bird gets printed**

One of the more painful things this department has to face, in a life devoted to facing pain, is the too-late notice. Say some group has a meeting or something scheduled for October 15th (a purely hypothetical date, we hope, with no resemblance, coincidental or otherwise, to any meetings living or dead). Well, anyway, the secretary or whoever is in charge of writing to FYI, drops us a line October 1 or even September 15th, feeling that it should reach us in plenty of time to alert the whole industry to the infinite possibilities for fun and education presented by his event.

But alas, it is too late and all we can report is that the gala was held with a good time by all who happened to hear about it by carrier

(*continued on page* 65)

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With the demand for the new Nikon F Automatic Reflex assuming gigantic proportions, and with the steadily growing popularity of the rangefinder-coupled SP and S3, the manufacturer has found it necessary to devote more of its facilities to camera production, and to the production of Nikkor lenses designed for these cameras.

Nikon is therefore discontinuing the manufacture of screw-mount Nikkor lenses for Leica, Canon and similar 35mm cameras, and is closing out its entire remaining inventory at drastically reduced prices, representing 50% off list.

| | REGULAR PRICES | SPECIAL SALE PRICES |
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| 35mm f3.5 | 93.00 | **46.50** |
| 35mm f2.5 | 143.00 | **71.50** |
| 35mm f1.8 | 183.50 | **91.75** |
| 50mm f2.0 | 109.50 | **54.75** |
| 50mm f1.4 | 159.50 | **79.75** |
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| * 85mm f1.5 | 309.00 | **154.50** |
| *105mm f2.5 | 159.00 | **79.50** |
| *135mm f3.5 | 141.00 | **70.50** |

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# LETTERS

To the Editor:

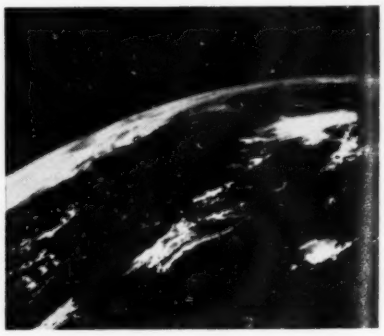
Referring to the report *Spy in The Sky* in July, 1959 issue of PMI, may we point to what may be a misunderstanding regarding the kind of film used in the Thor data capsules in the actual flights.

While it is possible that another company's film was used in some preliminary test, it is a fact that Kodak Plus-X Reversal Film was carried and exposed in the data capsule in the Thor missile fired on May 12, 1959 from Cape Canaveral. For the second camera carrying flight of the Thor on July 24, 1959 we supplied General Electric with a special Kodak Fine Grain Aero Film designated as our special order SO-213. This product afforded much higher definition with resultant increase in detail rendition.

We have been and are working very closely with the project engineer at General Electric's Missile and Space Vehicle Department in Philadelphia concerning the testing of further Kodak film products.

S. Phillips
Special Sensitized Products Sales
Eastman Kodak Co.
Rochester, New York

*A second bolt from the blue adds:*
. . . You might be interested to know that the film used in the data capsule of the Atlas missile fired on August 24 was Recordak Fine Grain Pancromatic film. The photographs



obtained with this film are excellent, and appear to be superior to any photographs obtained previously.

W. F. Swan
Manager
Special Sensitized Products Sales
Eastman Kodak Co.
Rochester, New York

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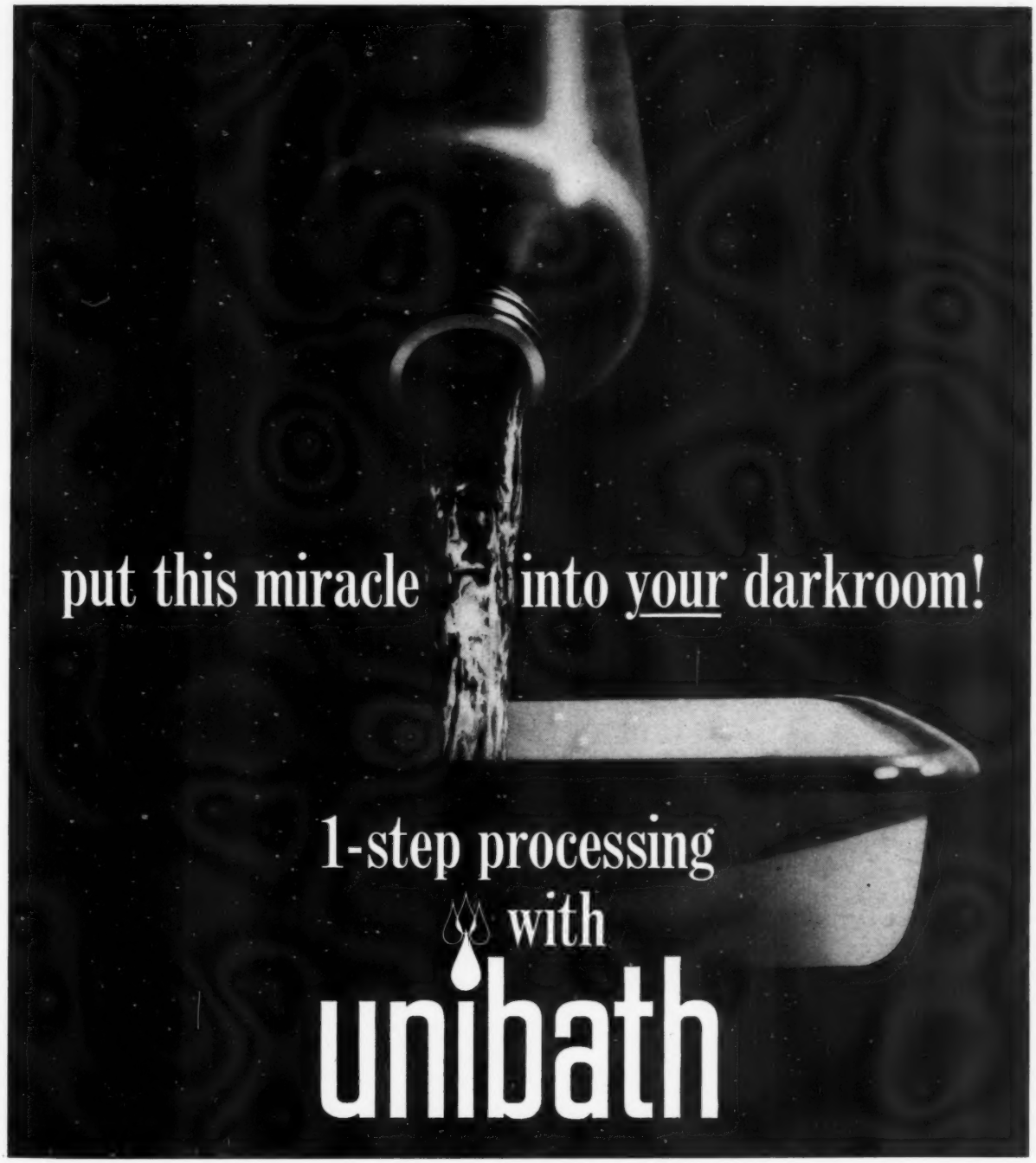


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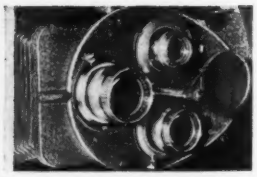
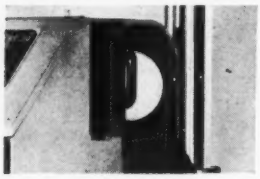
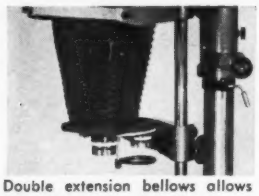


Three lens turret — accommodates lenses from 50 to 210mm focal length

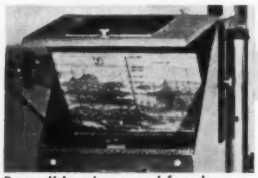


Built-in color filter drawer between light source and lens stage

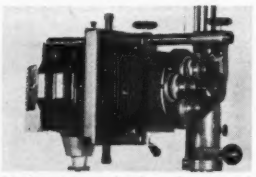
Rapid interchangeable condensers permit short exposures



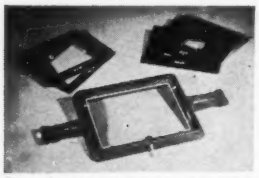
Double extension bellows allows .28 to 31x on baseboard



Reversible mirror used for observation when copying



Horizontal projection for mural size enlargements



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**NOVEMBER 18-21** 27th Annual Convention and Exhibit of the National Association of Photo-Lithographers. Municipal Auditorium and Hotel Muehlebach, Kansas City, Mo.

**DECEMBER 3-5** Third Annual International Visual Communications Congress sponsored by the SRE. Statler Hilton Hotel, New York, N.Y.

## MONTHLY MEETINGS

**FOURTH MONDAY** • Rocky Mountain Industrial Photographers. Contact P. H. Broadie, 2170 S. Lincoln, Denver 10, Colo. Telephone PEarl 3-2200.

**LAST MONDAY** • Southern California SPSE. Contact Ben Augustine, 235 Annandale Rd., Pasadena 2, Calif. Telephone MU 1-0076.

**SECOND TUESDAY** • New England Police Photographers. Contact Sergt. William R. Murphy, Brookline Police Dept., Brookline, Mass. RE 4-1212.

**THIRD TUESDAY** • Binghamton Chapter of SPSE. Contact H. G. Morse, Ansco, Binghamton, N. Y. RA 2-4221, Ext. 573. • Industrial Photographers of Southern California. Contact Janet Marshall, Executive Secretary, 5463 Virginia Ave., Los Angeles 29, Calif. HO 5-6614.

**SECOND & FOURTH THURSDAY** • Industrial Photographers Association. Contact Tom Holbarton, 181 Lake Drive West, Packanack Lake, Wayne, N. J. OX 4-2058. Or R. Handley, The Port of New York Authority, 111 8th Ave., New York 11, N. Y. AL 5-1000, Ext. 605. • (Second Thursday) National Visual Presentation Association, Inc. Contact M. E. Schack, 19 West 44th Street, New York.

*If you wish to have your organization's meetings listed in future issues send the necessary information addressed to* **COMING UP, PMI,** *33 West 60th St., N. Y. 23, N. Y.*

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by Lloyd E. Varden

# PHOTO METHODS FOR TOMORROW

**Air-living fungus can cause lens clouding; repro wheels at Ferris**

Dr. T. Ohtsuki of Ochanomizu University in Tokyo, Japan, has found a unique fungus named *Aspergillus glaucus var. Tonophilus* that is capable of living on air alone. Because of this ability it can grow on a perfectly clean glass surface, causing clouding. When the fungus settles on a photographic lens, regardless of the care one has taken to keep the lens surfaces clean, its spores can germinate and grow to a sufficient extent to reduce optical efficiency and sharpness. For continued growth, however, organic nutrients are found to be essential.

The fungus can grow only when the relative humidity falls within 60 to 95 per cent. This R.H. range is common in nearly all areas of the U.S. Whether the fungus itself is abundant in the U.S. was not mentioned by Dr. Ohtsuki, but photographers travel so much these days it is bound to reach our shores eventually even if it is not here now.

During growth the fungus exudes very small drops of water containing acids, such as oxalic, citric and acetic acids. These possibly could corrode the glass surfaces of a lens to produce permanent damage. Fortunately, a growth inhibitor has been developed should the fungus begin to cause serious problems. The inhibitor is fumed onto lens surfaces and is said to remain effective against the fungus for ten years.

**Ferris Seminar**

The Ferris Institute in Big Rapids, Mich., is a State College of Michigan dedicated to training technicians in numerous industrial areas: architectural drafting, automotive servicing, air conditioning, printing, reproduction processes, etc. The Institute offers a two-year course for students desiring to become a "visual reproduction technician," which covers diazo processes, blueprinting, photocopying, offset duplicating, microfilming and electrostatic copying.

From August 16-21, 1959 the First Summer Industry-Ferris Reproduction Seminar was held. The purpose of this seminar was to determine what subjects should be taught in the two-year course and the technical level at which the unit courses should be aimed. Cooperating with the Ferris Institute in the seminar were representatives from manufacturers and various trade associations, the latter including the National Association of Photographic Manufacturers, the Society of Reproduction Engineers, the Association of Photographic Sensitizers, the National Association of Blueprint and Diazotype Coaters and the International Association of Blueprint and Allied Industries.

**Teachers learn**

Lectures on reproduction processes, panel discussions and recommendation sessions filled a five-day program. The 30 lectures and panel discussions ranged from "Light and Energy," Dimensionally Stable Materials, Litho Gelatine Transfer Method, Continuous Flow Cameras, Monobaths and Stabilizers, Silver Halide Future, Xerography Theory and Principles, Offset Reproductions, Magnetic Documenting and Encoding, "to Videograph" and ending with "Panel on the Future of Reproduction Processes."

At various times during each day the industry participants of the seminar met in separate small groups along with Ferris Institute instructors to consider the importance of the subjects presented for training purposes. In other words, the Ferris Institute wanted to learn from industry-experienced people just what subjects should appear on their curriculum for the two-year course.

There was a considerable diversity of opinion as to what students should be taught. And there was no firm

*(continued on page 16)*

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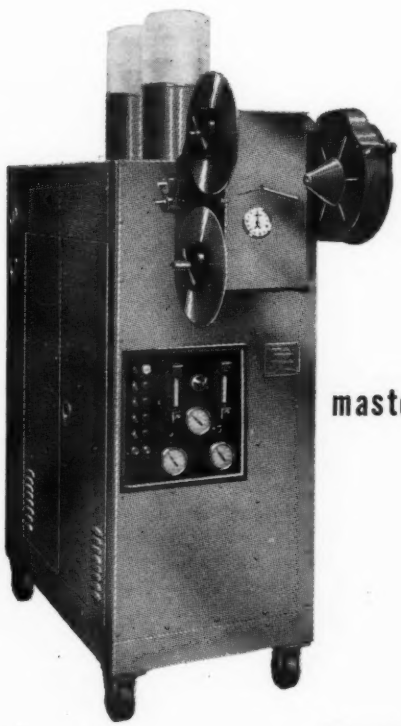

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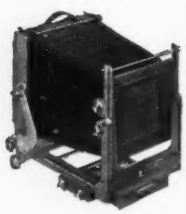

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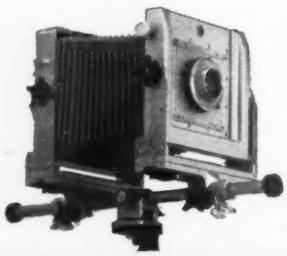

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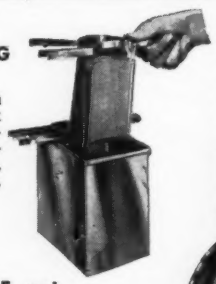

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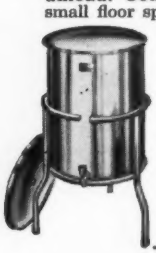

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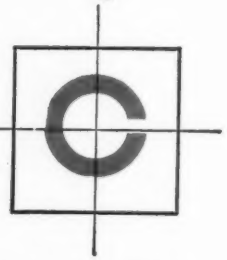

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## METHODS FOR TOMORROW

*(continued from page 14)*

agreement on what subjects could be eliminated without harming students' future careers. In general, subjects of a technical nature were considered of much less importance than practical or how-to-do-it subjects. Students intending to engage in sales representation for a manufacturer of diazo, blueprint, silver halide or other reproduction materials and equipment, according to the concepts expressed at the seminar, should be rather ignorant of technical details if they want to succeed. Supervisors of reproduction departments, on the other hand, should know a bit more than salesmen. But even supervisors should have their knowledge restricted technically and centered more around the practical aspects of the subject.

Not all the attitudes of the industry representatives were in keeping with the above philosophy, but those who were in disagreement were almost invariably engaged in research and development work. It is regretable that people engaged in sales and administration should be so far separated in their thinking from scientists, especially in businesses that are inherently technical. It was very revealing to this writer how great this separation really is after hearing the various comments made following the second talk of the seminar. The talk was an introductory discussion about light and energy at a high school level. Nevertheless, the industry representatives who were sales-minded considered the subject too "theoretical" for a technician's training course. Fortunately, it was finally agreed to recommend this subject to the Ferris Institute as an appropriate one if it were expanded to include the relationship of process characteristics to light source characteristics. (Actually, this is the very thing the talk was about, but the use of simple expressions such as "wavelength structure," "response characteristics," plus curves for illustration purposes, caused many attendants to regard the talk as highly technical and impractical.)

The Ferris Institute has certainly set a fine example in bringing industry representatives together with their own staff in a serious effort to determine the best course of action for training reproduction technicians. A continued program of this sort can only lead to a better harmony between educational and industrial viewpoints, and will eventually lead to an ideal program of instruction.—THE END

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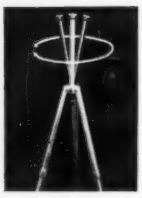

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**by Samuel Lang & Leonard Zoref**

# INDUSTRIAL COLOR

### Copying is not as easy in the color lab as it was in school

The following letter was received from David Fuller, Back Engraving photo lab, Philadelphia:

"A large part of my work is making duplicate transparencies from 35mm to a larger size. We use, in addition to temperature controls, an Omega B-6 enlarger with an Ascor electronic flash unit, specially adapted so that the flashtube replaces the normal light source of the enlarger. Beneath the lens, there is a Kodak vacuum frame with matrix pins to register the film. For the color correction, there is a set of 05, 10, 20 and 30 filters in six colors (cyan, magenta, yellow, green, red and blue) cut to fit the color slot above the condensers.

"Although I have done a fair share of printing Type C prints with C, Y and M filters before, I have never made any duplicate transparencies. I have not been able to find any information on the use of electronic flash for the exposures.

"I understand that masking (highlight and principal masks) is pretty much eliminated by using electronic flash and that this is the method used primarily today in making duplicate transparencies. I understand further that by the use of Anscochrome (Daylight), there is less need for a mask than, for example, by using Ektachrome E-3 (Daylight), where more contrast is incurred in duplicating and that therefore it is sometimes desirable to mask."

### Approaches to duplication

There are several approaches to the problem of duplicating and there is no doubt that the use of an enlarger is a good approach, especially for blowing up 35mm transparencies. A good copy camera with a well-balanced illuminator box will work out equally well. A condenser enlarger will tend to give a more-contrasty image which will appear sharper. This contrast is not always desirable, since one of the problems in duplicating color transparencies is how to handle the increased contrast which is picked up in the duplicating process. A condenser will also tend to emphasize every scratch and imperfection on the transparency.

There are differences of opinion as to whether electronic flash or incandescent light is best for producing good duplicate transparencies, and which method is simpler and gives consistently better results.

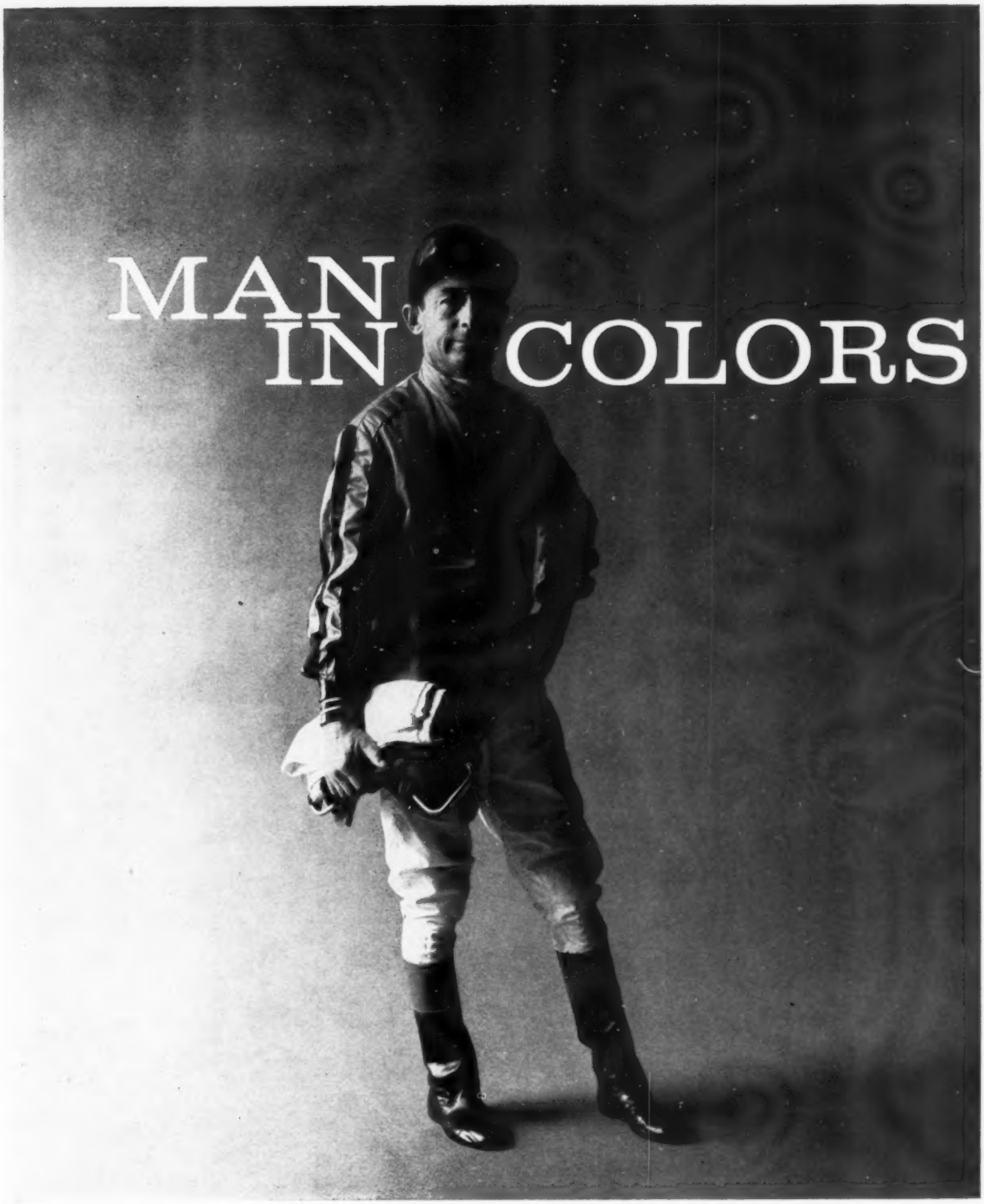
In our operation, all duplicates are made on a copy camera using a specially built, air-cooled illuminator box which contains 100-watt bulbs, boosted by a ColorTran unit plugged into a constant voltage transformer. We use the same type of light for copying too. Therefore, we have no need to stock film other than tungsten color film. Both cameras have electric shutters with accurate timers to minimize all variables.

None of the the manufacturers have, to our knowledge, published information on duplicating with electronic flash or, for that matter, is there very much on duplicating at all. In any case accurate duplicates are very difficult to make and unless you are willing to accept good-looking transparencies instead of accurate matches, you are in for headaches.

### Handling excessive contrast

Excessive contrast is always a problem when making a duplicate transparency. This can be partially overcome by the use of electronic flash, as well as using a lower contrast color film such as Anscochrome. For other than flat transparencies, however, it will not lower contrast sufficiently. You can lower contrast further by overexposing your film one stop and cutting your first development time by five to seven minutes. This will work with Ektachrome E-1. It will not work with E-3 due to serious color shifts that result from shortening developing times.

(*continued on page* 20)

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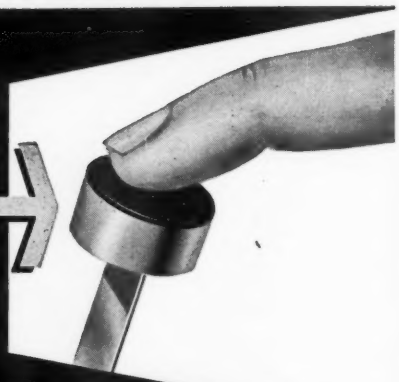

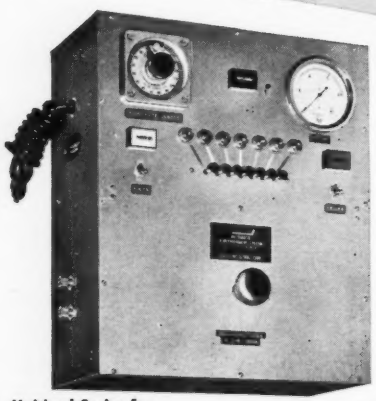

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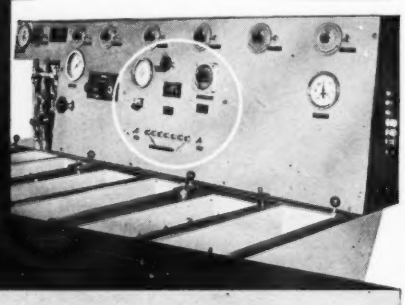

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## INDUSTRIAL COLOR

(*continued from page* 18)

In order to get accurate rendition of both highlight and shadow detail, it is necessary to mask, using both highlight and principal masks. Our feeling has always been that the highlight mask is just as important as the principal mask and that many times you are better off with no mask at all than omit the highlight mask. While the principal masks assist in maintaining shadow detail, they tend to flatten highlights and near-highlight areas. To prevent this, a highlight mask is necessary.

The Kodak vacuum register board will be very helpful if you intend doing photocomposing and want to be able to return your film to the exact position each time. A conventional easel will suffice provided you keep a sheet of black interleaf paper underneath to prevent flare.

### Masking a moot point

Most people object to masking 35-mm transparencies because of the difficulty of registering the mask to the original transparency. This can be simplified considerably by using an automatic registration punch and pin system such as that made by the Condit Manufacturing Co., Sandy Hook, Conn. With this system, you can punch registration holes in-between the sprocket holes of the transparency. A register pin glass is available for exposing the masks as well as the final duplicates. It is unnecessary to tape the masks into register and makes it easier to compare the original with your results without having to retape your masks into register in the event a retake is needed.

Printing filters are fine as long as they are used above the condensers. Otherwise you should use regular shooting filters.

An electronic densitometer will greatly simplify exposure calculations and permit easel or ground glass readings, depending upon the equipment you use. There are also several strobe meters which can be used successfully. The following reference materials are available:

Eastman Kodak Article E-25: *Making Duplicate Transparencies in Sheet Film Sizes.*

. . . Article S-8: *Photographic Production of Slides and Filmstrips.*

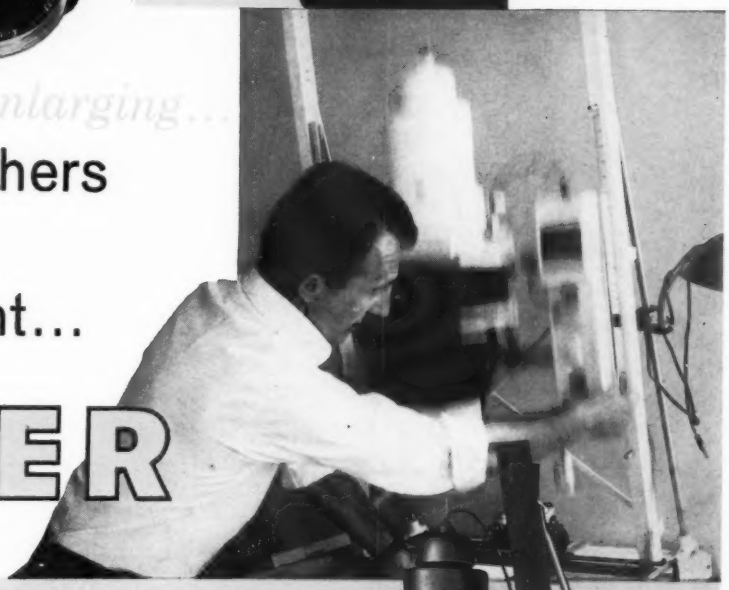
. . . Article E-16: *Duplicating Color Transparencies with Kodak Ektachrome Film E-2.*

Ansco: *How to make Better Color Pictures. (pp84-87)*

Evans, Hanson & Brewer: *Principles of Color Photography (chapter XV)*

*from shooting...*

*to enlarging...*



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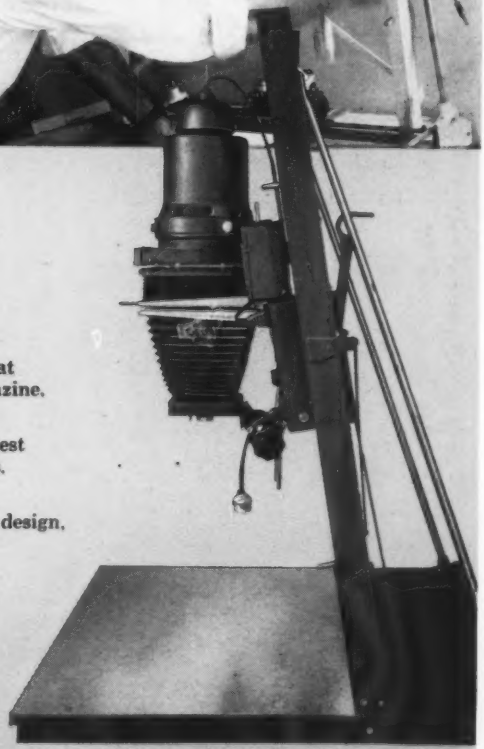

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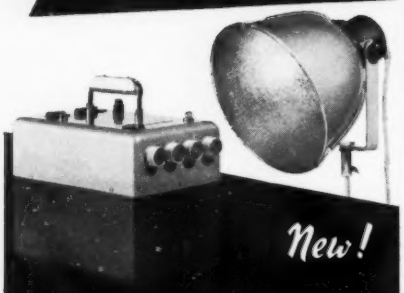


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Get more information. Circle 401, page 79

by Edward R. Farber

# ELECTRONIC FLASH

**There's more to electronic flash than meets the eye—with IR film**

During a recent criminal investigation, police officials wanted a picture of every person entering or leaving a night spot. To reveal the presence of a photographer would queer the project.

Here's how the photographer handled the job. He covered the rear windows of his automobile with black paper to conceal himself and his equipment from passers-by, the subjects of the investigation. He cut two holes in the paper—one for his camera lens and the other for his light source. He parked the car across the street from the scene and clicked away with his telephoto lens equipped 35mm without once revealing his presence, despite the fact that his light had to be bright enough to illuminate the subjects 100 ft. away.

The light source which made the project possible was a 100-watt-sec. electronic flash unit powered by a 6-volt inverter wired to the car's electrical system. The reflector of the flash unit was covered with a infra-red filter, and the camera was loaded, of course, with infra-red film.

While infra-red flash lamps have been on the market for some time, and most photographers are familiar with their application, the use of infra-red film with electronic flash has not received the attention its possibilities warrant.

## Good guide

Guide numbers at least as high as those obtainable with daylight Kodachrome can be expected with most electronic flash equipment used with infra-red film. Exposure varies, however, with the filters and the type of electronic flash unit used—but you should be able to adapt your unit to this specialized type of work.

Electronic flash is sometimes used with data recording cameras to photograph dials. The flash can be annoying as, for example, when used in the cockpit of a plane. The use of an infra-red filter over the source eliminates the annoyance. Of course infra-red flash is useful in medicine, botany and zoology to differentiate various structures, materials, or organs where normal photography or color photography fails. Here the simple and obvious place for the filter is over the lens.

## Low voltage works best

Low voltage type flash units—such as most battery portables—seem to be relatively more productive of infra-red than the higher voltage types. Experiments with a GE FT110 showed an infra-red efficiency of nearly three times as high at 500 volts as at 2000 volts when the tube was loaded with 50-watt-sec.

At low loadings, such as 12-watt-sec., the efficiency was found to be only twice as high.

If it's desired to filter out visible radiation, a Wratten 87C filter should be placed over the reflector. Even with as much as 1000-watt-sec. there is no light visible unless one looks directly at the light source while in total darkness.

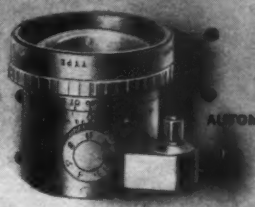
A larger reflector is preferred since it diminishes the glow on the dust particles immediately in front of the filter. Of course, the larger filter is also more expensive. Best bet is to buy Wratten gelatin filters and mount them in glass yourself. (Only for mounting in front of the source . . . not in point of the lens.) With this filter over the reflector and a 100-watt-sec. Stroboflash II, a guide number of 160 was obtained with Kodak Infra-Red film developed for 19 min. in D-76 at 68°.

## Phosphorescence

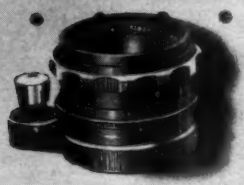
Your flash unit can be "interesting, educational and instructive" when used to make transient silhouettes. This stunt, which I first saw at the GE Lighting Institute in Nela Park, Cleveland, Ohio, makes use of a surface covered with phosphorescent material. You can buy it in the form of paint or pre-coated cardboard

(*continued on page* 24)

# the ALPA formula



AUTOMATIC Retrofocus 24mm f/3.5



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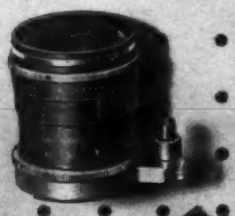

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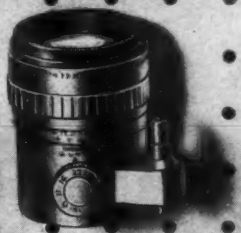
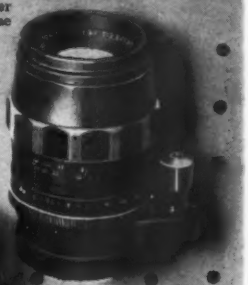
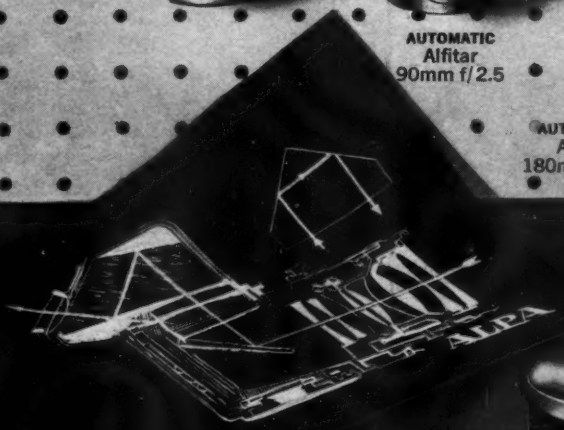


AUTOMATIC Alfitar 90mm f/2.5



AUTOMATIC Tele-Xenar 135mm f/3.5

AUTOMATIC Alitar 180mm f/4.5



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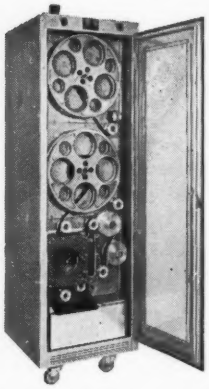

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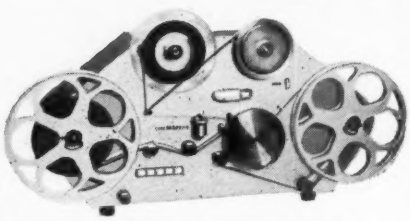

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**Get more information. Circle 500, page 79**


## ELECTRONIC FLASH

(*continued from page 22*)

at display material supply houses.

An electronic flash is used to create a silhouette on the surface which will fade away slowly or can be wiped away by another flash. Good trick was the image of an arrow piercing a balloon—flash was triggered by the noise of the bursting balloon.

One of the great advantages of electronic flash—its low cost repeatability—is far too seldom used by industrial photographers. Many architectural shots, both indoor and out, can be improved by night "walk-around" techniques using a portable unit to paint with light. If reasonable care is taken to direct the light properly, persons in action can be included in various picture areas or, better yet, the same person is used to point out various features on a large piece of machinery.

One of the more interesting shots of this type was of kids skiing and "bellyflopping" in a tree-covered park. The photographer put somebody on guard at the camera and fired the flash from behind trees, forming a pattern of activity all over the hill. The snow absorbed little light, so the illuminated areas were large and effective.—THE END

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by Arnold Eagle

# INDUSTRIAL MOTION PICTURES

**In which we continue to crusade for enlightened 16mm projection**

Justice for 16mm films and audiences demands a certain level of performance of projectionist and projector.

The projectionist must know his machine, his screen and his acoustics. Within the capabilities of his equipment, he must deliver the clearest image and the truest sound possible.

The projector should give a steady image, free from flickers and jumps. The film should not "breathe"—that is, it should not weave in and out of focus. The image should be sharp from corner to corner. It should be evenly illuminated with steady brilliance from corner to corner. The sound should be well-modulated, free from flutter, hum and distortion; it should reproduce music and speech naturally.

These goals are not unattainable. With a good projector in good working order and with a little care and knowledge, they can be achieved.

The first problem is to find a suitable projection area. A room with a separate projection booth is ideal because it eliminates annoying projector noise and extraneous light from the projector lamp.

In temporary set-ups, it is best that the room be completely dark, although a certain amount of light, not exceeding ten per cent of the screen brightness, is acceptable. Commercially-made window shades and drapes designed for darkening rooms are available at low cost. Any bright light or object within view distracts the viewer's attention and destroys the cinematic illusion; it breaks the spell which a good film should cast.

The image should fill the entire screen. White margins reflect light from the projector and psychologically "washout" the picture.

Projection lenses available in focal lengths from 1 to 4 in. help the projectionist fit his equipment to rooms of various sizes and shapes. The new Bell and Howell Filmovara zoom lens promises to be a convenience. Its focal length adjusts from 1¾ to 2½ in.

Seats should be arranged so that the nearest viewer is no closer than twice the width of the screen when using a matte screen. The farthest distance from the screen for comfortable viewing should not exceed six times the screen width. In other words, if a 6-ft. matte screen is used, the nearest viewer should be 12-ft., the farthest, not more than 36 ft. from the screen.

For beaded screens, the nearest distance is 2½ times the screen width, so that in the example above, the nearest seat should be 15 ft, from the screen.

The choice of screen type depends upon the projection room. Beaded screens are much brighter when viewed in a direct line with the projector, but their brightness falls off rapidly at angles of view greater than 20 degrees. On the other hand, a matte screen is nearly as bright at 35 degrees off center as it is head on. The lenticular screen has viewing and reflection characteristics about midway between the matte and beaded screen and is an effective compromise.

When not in use, a screen should be covered or rolled up. A screen left unprotected may yellow, get dirty, spotted and streaked. Some screens can be washed; consult the manufacturer's directions on this.

Screen brightness is measured in foot-lamberts; it depends upon the projector lamp output, optical efficiency, image magnification and the reflective ability of the screen.

**Screen bright, screen light**

Screen brightness is measured without any film in the projector. The standard of brightness for 16mm and 35mm projection is between 9 and 14 foot-lamberts.

A 16mm projector, using a 750-watt bulb, projecting on a 60-in. matte screen of 75 per cent reflectance, will give a screen brightness of about 10 foot-lamberts. The same projector with 1000-watt bulb, will give 10

(*continued on page* 28)

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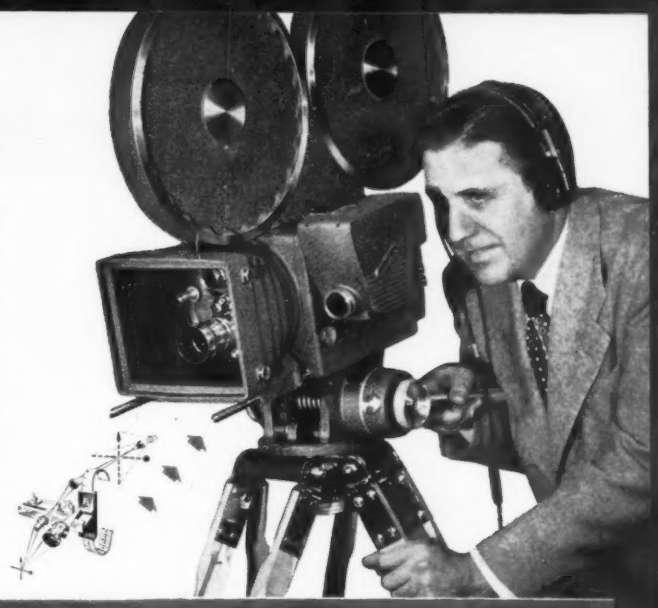

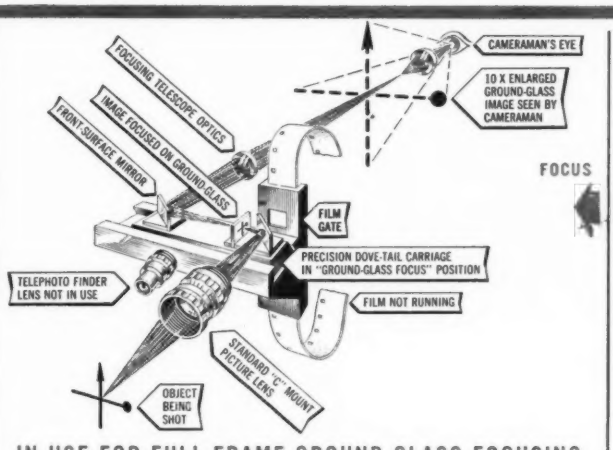
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FILM NOT RUNNING
STANDARD "C" MOUNT PICTURE LENS
OBJECT BEING SHOT

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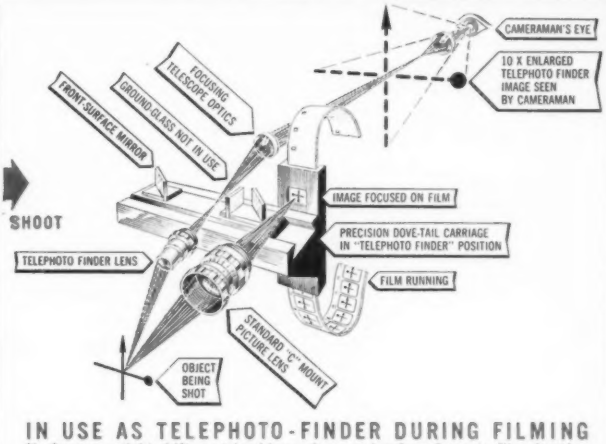
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FRONT-SURFACE MIRROR
IMAGE FOCUSED ON FILM
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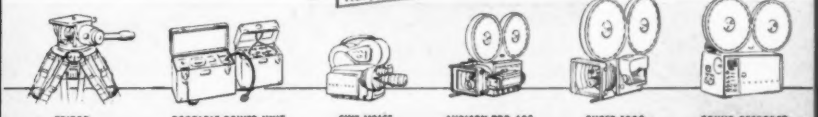

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## INDUSTRIAL MOTION PICTURES

(*continued from page 26*)

foot-lamberts on a 72-in. screen. Some of the newer projectors which use a 1200-watt bulb make possible a 20 per cent larger screen (approximately 90 in.) with equal brightness.

If the audience exceeds 250 people and the screen must be wider than 10 ft, one of the arc lamp projectors should be used.

With all projectors, the light in the center of the screen image is brighter than the light at the sides, but this is considered normal and acceptable as long as the light on the sides is at least 75 per cent as bright as at the center.

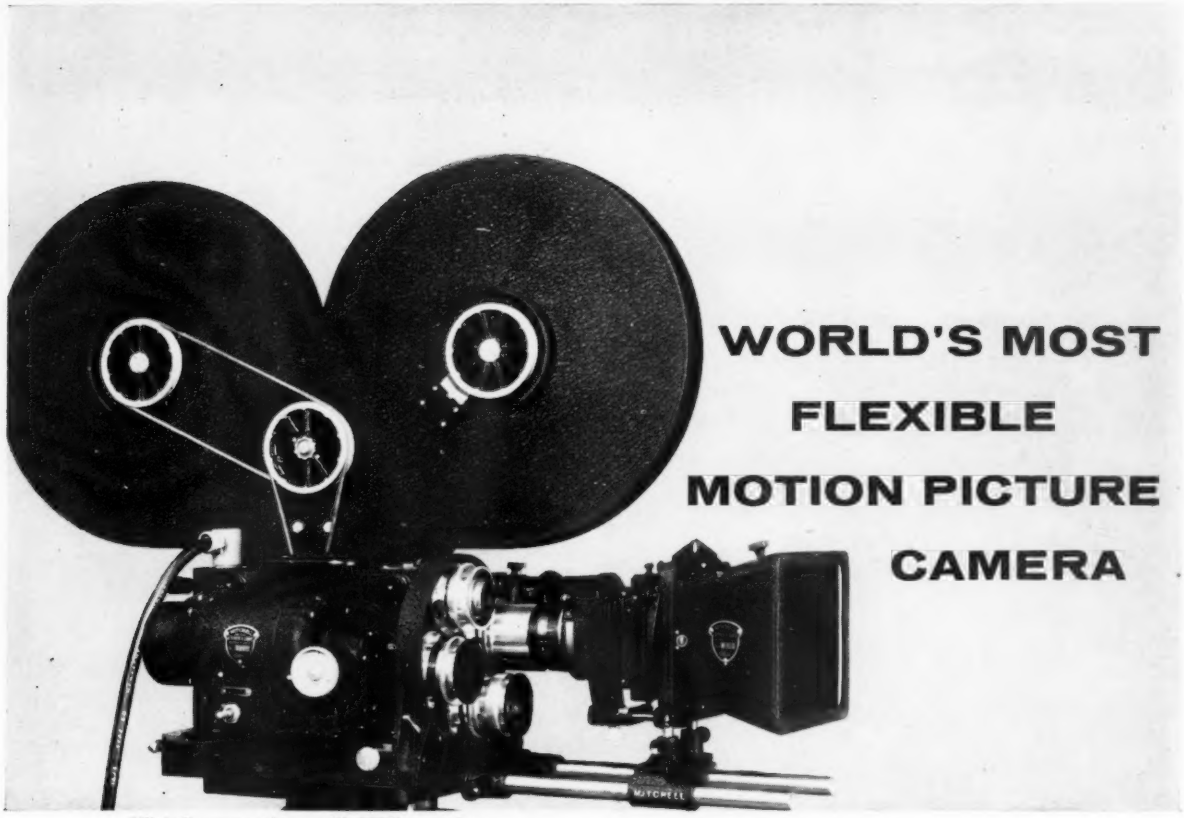
In a previous column, I discussed the problem of projection lenses. Because of the need for maximum light transmission, a projection lens should be at least f/1.2. A good 2-in. projection lens can cost from $150 to $200. For one who wants perfection, it is a worthwhile investment.

To meet standards of the Society of Motion Pictures and Television Engineers, a projection lens for 35mm must have a resolving power of 28 lines per mm, the equivalent of 56 lines per mm with 16mm. This is just about the limit to the resolving power of properly exposed 16mm Kodachrome.

Before the war, most projection lenses resolved 100 lines per mm at the center but only 20 lines per mm at the edges. During recent years, manufacturers have added an extra element to flatten the field. These lenses have a resolving power of about 90 lines per mm in the center and 40 lines per mm which is considered an improvement for practical purposes. A simple lens test may be made by using the SMPTE projection test slide or projecting some clear black-and-white titles.

An unsteady projected image is not always the fault of the projector. The film itself may have acquired some unsteadiness during exposure or during printing. This is the reason for using a test film that has maximum steadiness to test a projector for this fault. The JAN (Joint Army-Navy) specifications permit a .2 per cent horizontal movement and a .3 per cent vertical movement. When they are new, most projectors can meet these specifications. But as gears, pressure plates and pull-down claws wear, the image grows less steady. The more neglected a projector is, furthermore, the more wear and tear on the film. Manufacturers of better machines are using new, extra-hard alloys from which pull-

(*continued on page 34*)



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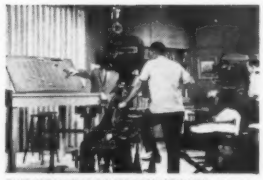
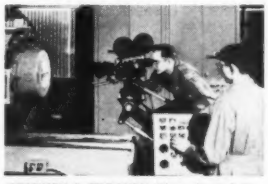


**BUD WILKINSON PRODUCTIONS** shoots its award-winning TV Sports Series with the Mitchell.



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New speed and convenience are built into this latest heavy duty professional flash unit, the Model M HI-PRO. In addition to 150 watt-seconds, 4000 BCPS, Kodachrome Guide No. 90, it has a modeling light, 6-second recycling time, and can be shutter tripped or slave operated with built-in photocell. Use the Model M everywhere . . . 110 V AC, 60 Cycle, weighs 4½ lbs. **LIST—$109.95**

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**Get more information. Circle 446, page 79**

by David B. Eisendrath, Jr.

# WORKING PHOTOGRAPHER

**Some comments on those edifying bull sessions at the 1959 NIPC**

The National Industrial Photographic Conference recently held in Los Angeles attracted, as usual, a good cross-section of industrial photographers from across the nation.

One of the most popular kind of program given each year is the round-table which is really an informal bull session. Each day arrangements are made to have meeting rooms available after the formal programs and here any number of interested fellows get together to literally "bat-around" a discussion of one of the subjects the programs have been about. Sometimes there are only half a dozen specialists interested in fine points of reproduction, or there may be fifty or more who want to bull session about motion picture production, high-speed photography or miniature cameras.

Inasmuch as the round-tables were informal and often off the cuff (as well as off the record), and inasmuch as the formal programs themselves will be reprinted elsewhere, I'd like to put down some of the random notes I made for my own notebook that I found to be of particular interest. You may be so sophisticated or erudite that gadgetry and trick technique bores you, but I think that most working photographers are always interested in this stuff.

Ulric Meisel in a color panel suggested that when shooting color negatives of important scenes and it is impossible or impractical to include a grey scale or grey card in the picture area, you should set up another camera just outside the picture area and shoot a close-up of your grey card by the same illumination that your picture is made with and on the same emulsion of film. This will serve as an excellent guide to printing, if both this exposure and the main picture are processed together.

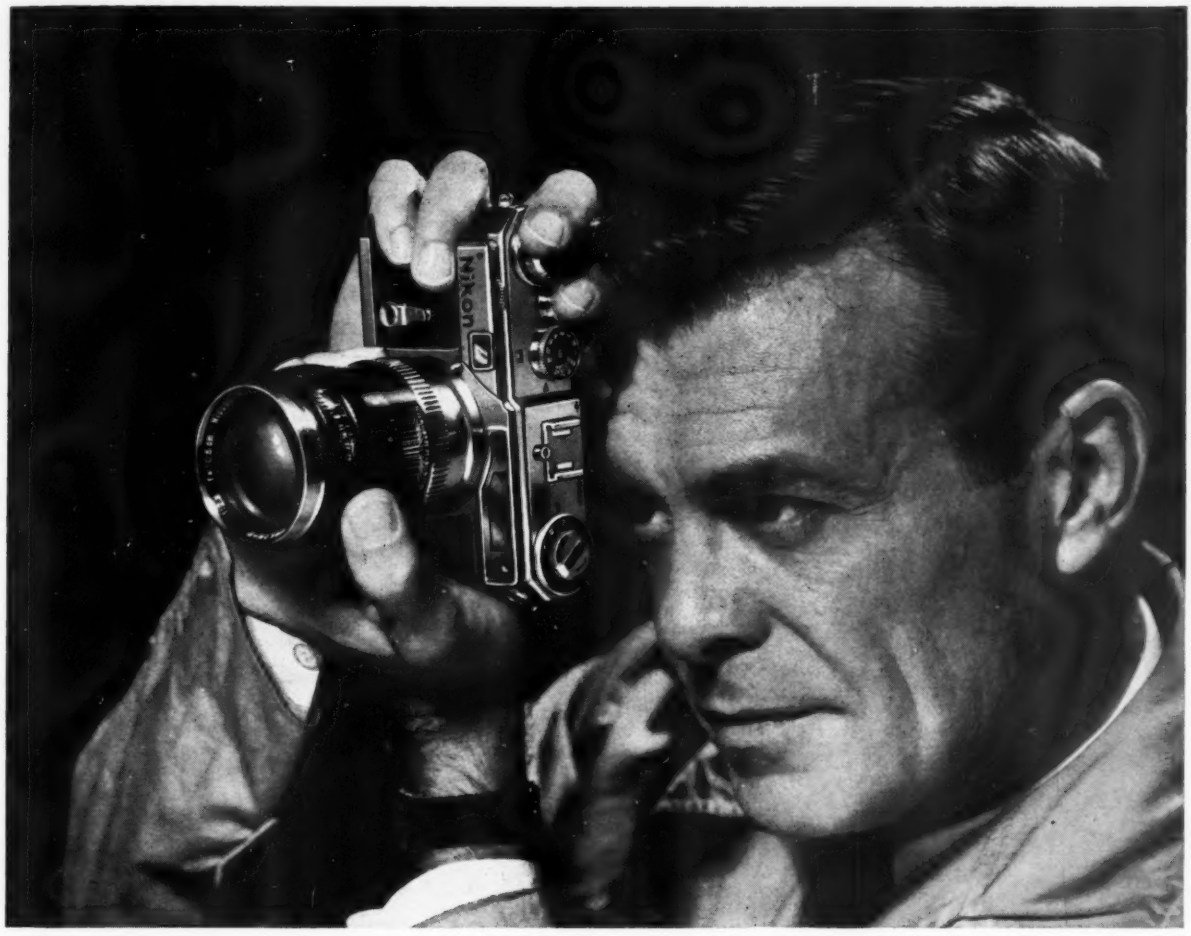
Our own Len Zoref (whose formal remarks will probably appear in his own column) added a note in informal session that when color prints had to be made with extreme resolution and fine detail, a Dye Transfer from a sharp original transparency would still give more satisfaction that color negative processes, although new materials soon to appear on the market may change this. On the subject of latent image failure on Ektacolor paper, Zoref also mentioned that in leaving printing paper to stand at room temperature after exposure so that uniform aging or degradation would take place in producing many prints, two hours of standing at room temperature after exposure was equivalent to about four days under refrigeration.

**Sky blues**

In a session on aerial photography in color, ideas flew fast and furiously. Some workers have been shooting Ektachrome transparency material and then processing it in C-22 chemicals as a color negative. It produces a color negative without a masking layer, and although it does not give truly accurate color fidelity, it gives satisfactory color rendition, but has the added contrast which is so desirable in aerial work. There was also some discussion of eliminating blue haze in aerial work, and it was pointed out that with transparency material, you sometimes got more satisfactory color when shooting indoor-type color materials with conversion filters. The results for ground photography were warmer and less blue and if you did not need blue sky in your pictures, the effect was quite satisfactory. Another worker said that he liked to make his air shots in late afternoons where the redder rays of the sun helped to offset the blue haze, and the low sun angle introduced shadows which gave good contrast and outlined subject matter.

Clarence Hanson of Allis-Chalmers who gave an excellent talk on color illustrations told of some problems he had and how he solved them

*(continued on page 32)*




*why the man who prefers a rangefinder prefers the*

# NIKON SP

Ask the man who uses a Nikon SP the reasons for his preference, and invariably he will mention these four:

**1 – THE UNIVERSAL VIEWFINDER SYSTEM** because it has built-in finders for six focal length lenses – 28, 35, 50, 85, 105 and 135mm – four with automatic parallax compensation. And, as a previewer, it helps him select the right lens faster and easier. *Only the Nikon SP offers you a 6-lens Universal Viewfinder System.*

**2 – THE NIKKOR LENSES** because of their outstanding resolution and color rendition, even at maximum apertures. For as important as lens interchangeability is to a '35', equally important is the quality of the lenses and the consistency of that quality in all the focal lengths.

Any lens maker who can produce an outstanding lens or two or three, has reason to be proud. *But, only Nikon offers you 20 outstanding lenses – 20 incomparable Nikkor lenses – ranging from 21mm ultra wide angle to 1000mm super telephoto.*

**3 – THE ELECTRIC MOTOR DRIVE** because this remarkable compact accessory brings to the already versatile Nikon SP an even greater effectiveness – *automatic fire power.* Battery operated, it can be used anywhere – to shoot single exposures, bursts of 2, 3 or more – right through an entire 36-exposure roll – at a rate of up to 3 per second. A fleeting expression, a quick gesture, a dramatic action sequence – you can't miss! *Only Nikon offers you an Electric Motor Drive.*

**4 – ITS 'ADVANCE-FOCUS-SHOOT' HANDLING EASE** because as important as quality, features and versatility are to a '35', equally important is the speed and ease with which they can be brought into play. The effortless, 3-finger handling of the Nikon SP is one of the secrets of its smooth responsiveness, its speed in action, its uncanny ability to meet the challenge of any situation and emerge with great pictures. *Only Nikon offers you 'Advance-Focus-Shoot' handling ease.*

**Get more information. Circle 480, page 79**

These are the four essential reasons he will give you for preferring the Nikon SP – if you ask him. Fundamentally, he is interested in results. He expects the finest, and he has every right to, for the instrument he is using is the finest rangefinder-coupled '35' money can buy.

Nikon SP with 50mm Nikkor f/2 lens, $329.50; with f/1.4 $375 at your Nikon Dealer. For complete details write for illustrated brochure to Dept. PM-11.

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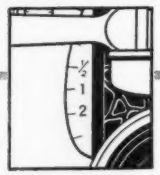
# Get fades, lap dissolves with New Bolex 16 mm Reflex!




**NEW Variable Shutter** makes fades easy. Hand-backwinding for perfect laps, too. Even automatically timed fades with the exclusive Rexofader. Parallax ended by reflex viewing—no more figuring distance or worrying about focus. Just look and shoot! Speeds from 12 to 64 fps... footage and frame counters . . . settings for time exposure, single frame and continuous running. With Lytar 1″ f/1.8 f.m. lens, the H-16 REX is $400.00. Lenses and Rexofader shown, optional at extra cost.

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**BOLEX**

Get more information. Circle 482, page 79

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Sure, we have a DeGroff AIRWAY SHUTTER RELEASE that can be used on all cameras. But the reason DeGroff has 14 different models is to give you the *most effective use of* YOUR camera. DeGroff AIRWAY SHUTTER RELEASES are patented. That's why no other manufacturer can offer you this service. Trips shutter at any distance from 5 in. to 50 ft. or more.

*See your dealer or write* *Fully guaranteed*

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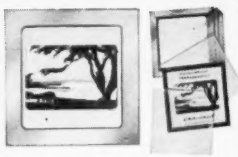
One-piece aluminum frame and ultra-thin micro glass for mounting transparencies in Eastman standard Readymounts.



No. 20 – Box of 20 frames & 40 glass, $2.00
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Other Sizes Available · 2¼ x 2¼ · 2 x 2 Super Slide · Airequipt Masks & Glass · Stereo (2) · 3¼ x 4 Frames, Masks, & Glass.

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## WORKING PHOTOGRAPHER

(*continued from page* 30)

and mentioned that in shooting a large exterior for a national advertisement in color he had to shoot the frame of a six-room house at night with models, furniture, and elaborate set-up. Through experience he recommended rain insurance (he also was lucky enough to have plastic tarpaulins available) and knowing he might attract a crowd (he did) he had alerted the police department and also took out crowd insurance in case anyone got hurt. Hanson also showed some excellent multiple exposures made in color. one of a fork lift truck with a load in several positions and showed the effectiveness of having the key image get a little more exposure than the others so the overlapped images are not so confusing.

He also showed how he used an overhead lift truck called "The Giraffe" which lifts an electrician or engineer (or a photographer!) 86 ft. off the ground and over walls, tanks and other obstructions. Hint from Hanson: before going up in cranes or overhead, work out good signal system with man below so he can clean up junk, move people in or out of the picture, stop traffic, or get you down when you are through. He also showed some spectacular color of products supposedly operating at ocean bottom; then he showed the trick fish tank with wet partitions framed in plexiglass so fish and bubbles could move about naturally while the product rested safely in a dry center partition.

One of the most interesting tricks I learned from him, by the way, was in the making of those shots that are always such a problem showing a group of a few people seated watching a movie, a slide, or a projection microscope image on the screen. Normally, to include the projector and screen and audience, the projector is so close that the screen image is quite small. Hanson neatly solves this problem by making a double exposure–the first with the set-up as it is but *no* image being projected; the screen area being kept dark or black. Then he double exposes onto the same film by using a long lens to give an exposure of *only* the projected image, but big enough to fill the screen area.

Five days of exposure to an exchange of practical working ideas was the reward most of us found at the National Industrial Photographic Conference. So with this conference barely over, we are already working on next year's program.—THE END

"CRONAR◈ Ortho A has reduced our handling time tremendously. We have completely eliminated distortion and kinking of film while maintaining tolerances of .001 of an inch."

**—Vari-Typer Corporation, Newark, New Jersey**

*The Typemaster, approximately the size and weight of a phonograph record, consists of a transparent film laminated onto a plastic disc for use in a Headliner, an automatic photo-composition machine made by Vari-Typer Corporation. This machine sets display type in sizes from 10 to 84 points.*

*Vari-Typer uses thousands of square feet of CRONAR Ortho A Litho Film per year in the manufacture of their Typemaster. Since switching to CRONAR, the company has reduced film spoilage and has cut handling time substantially. These savings are directly attributable to CRONAR's strength and stability.*

*If you work with film, there's a CRONAR Graphic Arts Film that can cut costs for you. Contact your Du Pont Technical Representative for more information. E. I. du Pont de Nemours & Co. (Inc.), Photo Products Department, 2430-A Nemours, Wilmington 98, Delaware. In Canada: Du Pont of Canada Limited, Toronto.*

Du Pont Representative John Horsfall, right, and Vari-Typer technicians inspect Typemasters on CRONAR Ortho A.

◈ Symbol and CRONAR are Du Pont trademarks for polyester graphic arts films.

*This advertisement was prepared exclusively by Phototypography.*

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***. . . through Chemistry***

Get more information. Circle 427, page 79

down claws are made. These will have a longer life and will not develop that destructive hook which rips sprocket holes. In modern projectors, the pull-down mechanism engages two, and in some cases, three, sprocket holes in each pull-down operation. This means that the projector will keep its loop even when one or two holes are torn.

It is when a projector loses its loop that the film suffers its greatest damage. The projectionist must be alert and ready at all times to stop the projector should the loop be lost. Many new models feature automatic loop setters which operate while the machine is running. The Victor has an automatic switch to stop the projector if the loop is lost or if the film is incorrectly threaded.

The ghost image which appears as vertical streaks on the screen is the result of the pull-down mechanism and the shutter getting out of sync: the film is pulled down while the shutter is still open.

All the gears and the pressure plate should be concave to lessen the abrasion of the film when it comes in contact with the metal. The film is damaged when gears and roller bind or get stuck and don't revolve.

It is sound which is the weakest part of most 16mm projectors, even when new. When they are worn, it is the sound which often deteriorates most rapidly. This is true of all machines; some hold up very well without special attention, but all machines should be tested with the SMPTE sound film tester to determine the degree of deterioration and the need for overhauling the sound system.

Excessive flutter and wow is a major problem in sound reproduction. This occurs when the sound track of the film does not move with even speed before the scanning beam of the exciter lamp. Slow wow can be detected in piano music and high speed flutter in flute or violin sounds. A gargling, unintelligible noise is usually the result of incorrect threading; the film is not tight enough around the sound drum. After it passes the film gate, the intermittant motion of the film must be changed to a constant velocity. This is so that when the sound track reaches the scanning beam of the exciter lamp, 28 frames later, it is traveling at an even, constant rate of speed. It is very important that the lower loop be made exactly as indicated on the projector being used. A shorter loop may tear the film and advance the sound; a longer one will scratch the film and delay the sound. *The position of the sound track corresponding to the visual image must be exactly 28 frames ahead.*

A photocell picks up the scanning beam from the exciter lamp after it is modulated by the optical sound track, converting it to current fluctuations. These are amplified to power levels sufficient to drive the speaker. The amplifier should have low distortion and have a frequency response from 50 to 5000 cps. It should be able to deliver at least ten amps to the speaker. All sound projectors have outlets for extra speakers and most manufacturers make special speakers which can be used with their projectors. Additional speakers are almost essential when the audience exceeds 100 people. If a single speaker is used, it should be placed near the screen.

In conclusion, get a projector which will fit your needs and get to know it. Test it periodically for both picture and sound. Keep spare bulbs on hand at all times. Be sure the instruction booklet and lubrication data are kept with the machine for quick reference.—THE END

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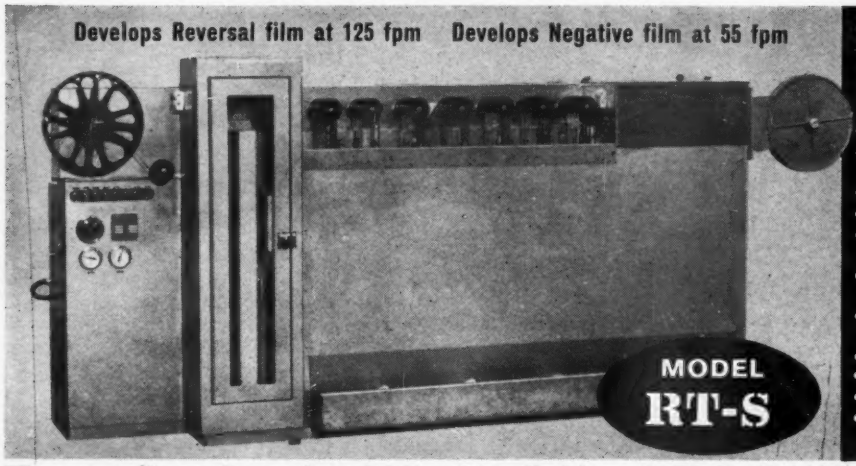
**WORLD'S FASTEST COMMERCIAL PROCESSOR**

**FOR REVERSAL & NEGATIVE/POSITIVE 16MM FILM**




- New impingement-type film Dryer
- Temperature control
- Rinse tank with spraybar after each chemical tank
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- New low-pressure type air squeegee
- Overflows and bottom drains
- Tachometer
- Solution and drybox thermometers
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- Stainless steel, type 316, tanks
- Daylight operation
- 1,200 Film Magazine
- Variable Speeds/Development Times

Wherever quality results are demanded in the fastest processing time . . . or wherever illumination is inadequate for quality image density . . . this newest, fastest combination 16MM Reversal and Negative/Positive film processor . . . the Filmline Model RT-S will consistently provide the solutions to these processing problems.

For in-plant, high-speed photography . . . for television stations, racetracks, and motion-picture film labs . . . the Filmline Model RT-S *is the ideal machine* . . . providing quality results at speeds to 125 ft./minute . . . and permitting increases of the ASA index 1000% on DuPont or Eastman Reversal Emulsions.

Fully equipped, ready for immediate operation the Model RT-S offers you high cost film processing features for the low price of only $6,450.00.

Filmline

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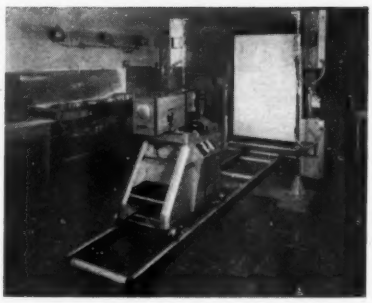

A most convenient device for photo-drafting with 70 or 105mm film is the Statfile® Recorder. Darkroom installed, it offers camera and projector combined in one unit, ready to copy subjects or make prints in any size up to 42″ x 60″ (or even to 60″ x 120″). Its horizontal arrangement offers certain operating advantages. The Statfile Recorder is remarkably versatile; a simple accessory makes one model a process camera which can produce negatives up to 13″ x 16″. STATFILE IS A TRADEMARK

# MINIATURE film pays off 3 ways

Everyone knows you can save space and gain security by copying valuable records on microfilm.

Not everyone knows that photo-drafting, using *miniature* film sizes, offers even more important advantages:

The larger negative sizes (70 to 105mm) capture *every* detail of the original copy. They are far easier to handle, read, and file. Best of all, they are the source of prints that are often *better* than the original.

Because they market micro- and miniature-film systems in *all* sizes (as well as systems for duplicating by photocopy and offset printing), Photostat Corporation representatives can make an unbiased recommendation of the system that's best for your requirements. Your inquiry is invited.

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**Is everything interchangeable** on the Hasselblad 500 C?
Yes, everything but the guarantee that comes with the name Hasselblad.
You can make "snap" changes between four top-quality Zeiss lenses,
the Planar 2.8/80 mm (standard lens), Distagon 5.6/60 mm, Sonnar 4/150 mm
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Exchange the standard hood for a magnifying hood or a prism
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with a built-in exposure meter or a rapid winding crank.
Ask your franchised Hasselblad dealer for a
demonstration of the famous Swedish Hasselblad.

**Single Lens Reflex 2¼"×2¼"**

***this is HASSELBLAD***

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Get more information. Circle 483, page 79

AN EDITORIAL

# THAWING THE SNOWSTORM

PMI's Prof. Varden, who's always bursting with a Socratic tease, caught us with our dictionary down the other day by asking "What is photography?"

The answer, of course, was deceptively simple: "Photography is the practice of recording an image by means of light, and making it permanent." Like all definitions, this won't suit everyone—but we'll go along with it to make our point.

Although the lens, the ground glass, the exposure meter, symbolize photography for most of us—photography considered from the scientific or practical viewpoint covers a lot more ground than the silver salt processes usually associated with it. Diazo, blueprints and photomechanical reproduction very likely account for more square inches of photography, for example, than do any other branches of the craft customarily associated with the word.

At this point in the march of American capitalism, the forces of free enterprise are running spang into a roadblock that would have set Horatio Alger back 150 pages. Business is being snowed with paperwork. Billions are being poured into the fight to reduce the costs of keeping track of our prosperity. And photography —especially the branches of photography last in the minds of many photographers —is one of the most potent weapons in the fight.

Being that this is a free country, the photographer has his choice of ignoring the rise of reproduction methods, or of joining forces with them. There are measurable advantages to the latter course. This issue of PMI contains a sampling of some of the smart ideas employed by photographic managers around the country who have pitched into the battle. In doing so they are saving their firms enough to keep them in gold plated view cameras for generations to come.

*The Editors*

# 3,750,000 P

**A third of a billion engineering reproductions afterwards, Westinghouse is still pleased as punch with its fully-automated microfilm-blowback system. Here F. M. Parker tells what time has told him about the tricks of the automation trade**

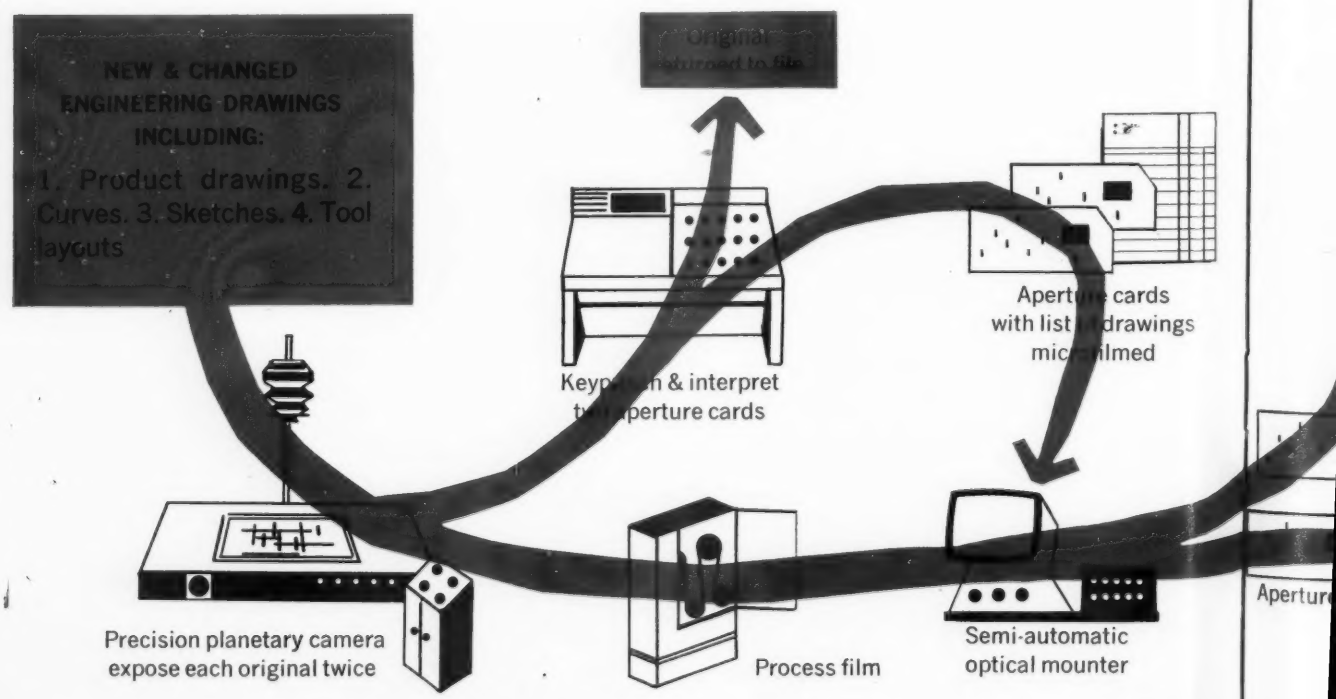
At the East Pittsburgh Division of the Westinghouse Corp., we believe we have one of the few, if not the only, completely integrated, automated drawing processing systems in industry today. And it has been operating successfully for over a year.

For all practical purposes, we have retired engineering tracings and use, in their place, working microfilms. The engineering tracing becomes an intermediate in the preparation of microfilm whenever the tracing is changed. But this is not the complete story. We even use working microfilm to a considerable extent in the creation of new or changed engineering tracings.

This might be a relatively simple accomplishment in a small, new operation. But East Pittsburgh is the "parent" division of the Corporation, from which most other Westinghouse Divisions have sprung. Our products range from giant custom-built generators, motors, circuit breakers, and switchgear control apparatus down to small, mass-produced fuses and porcelains. We have 15,000 employes, including more than 1,000 engineers and draftsmen organized into seven different product departments. Annually we prepare more than 30,000 new tracings and revise twice that number; daily, we process 3,000 requests for more than 15,000 prints.

Westinghouse's decision to automate its engineering drawing processing system at its main plant in East Pittsburgh was based on the following three fundamental considerations.

First came economy. Total annual savings will

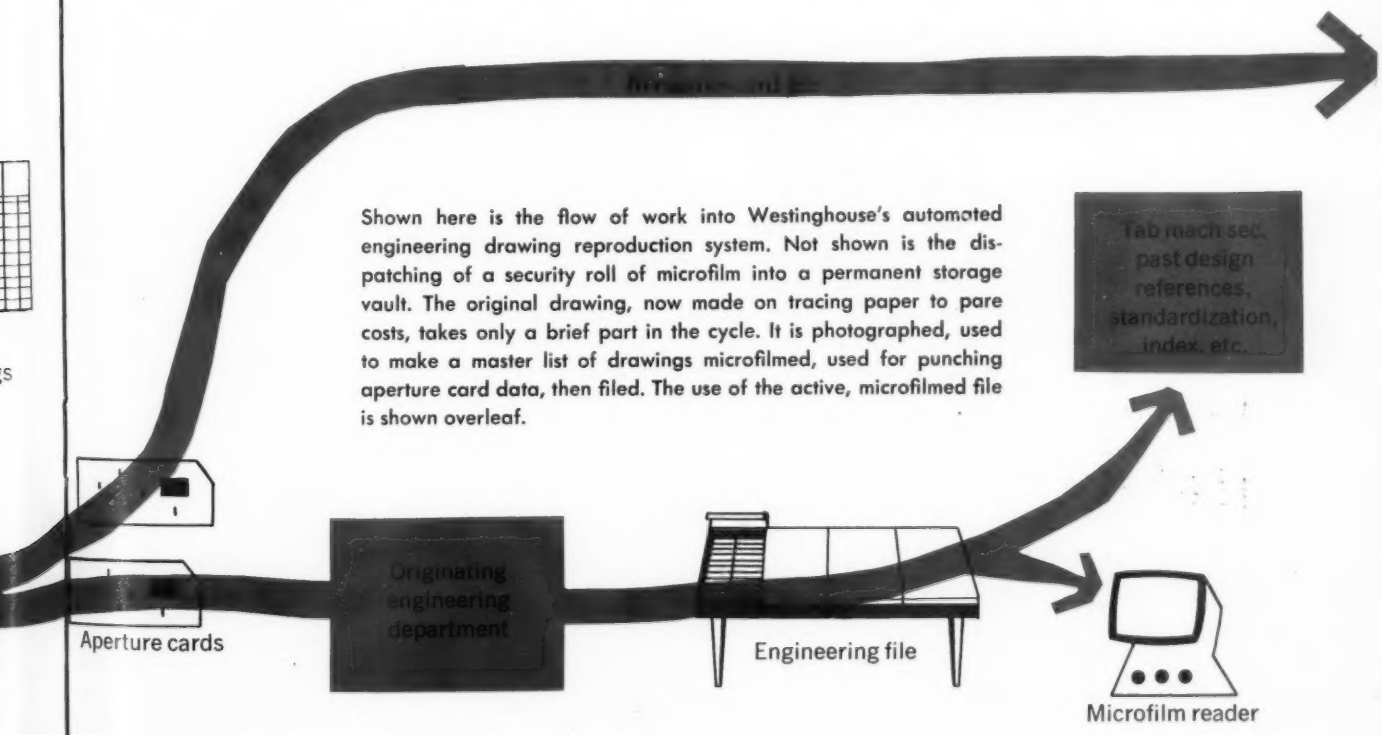

NEW & CHANGED ENGINEERING DRAWINGS INCLUDING:
1. Product drawings. 2. Curves. 3. Sketches. 4. Tool layouts
Original returned to file
Aperture cards with list drawings microfilmed
Key punch & interpret aperture cards
Precision planetary camera expose each original twice
Process film
Semi-automatic optical mounter

# PRINTS LATER

eventually reach $360,000 for the East Pittsburgh Division alone. The substitution of tracing paper for tracing cloth saves $50,000. The reduction of over 10,000 sq. ft. of badly needed floor space saves $25,000. A 50 per cent reduction in operating personnel saves more than $100,000. Other savings are realized from supplies, the substitution of aperture cards for prints, simplified transportation, storage, and filing problems, etc.

The second consideration was service. The advantages in ease and speed of handling aperture cards instead of the cumbersome tracings are rather obvious. A less apparent but very important advantage is that the aperture cards are available for making prints after the tracings have been pulled from file for change. Of course, we have safeguards which provide for flagging the aperture cards in those cases where the changes will affect current as well as subsequent production. This means that the aperture card is always available for printmaking unless it is already out of file for prints on an earlier request. This leads to a little recognized but important role in the administration of an automated drawing processing system: the shorter time cycle between the pulling and refiling of the aperture cards. We are working toward specializing certain print machines for certain drawing sizes (always more than one) and then rotating sizes so that all requisitions for a given size of print are being pulled from a completely replaced file while its size-counterpart is on the print machine.

The third fundamental consideration in choosing to automate our drawing processing system was the coding, in accessible form, of engineering design information. This step has such potential that it may easily dwarf the previous two considerations. The purpose of such coding is to aid the engineer in his design problems by electromechanically sorting out all previous solutions to similar problems. We have recently increased the range of possibilities in this respect by transferring the security roll number information from the card itself to the micro, thereby freeing seven additional card columns for engineering coding use. This transfer was accomplished by stamping the se-



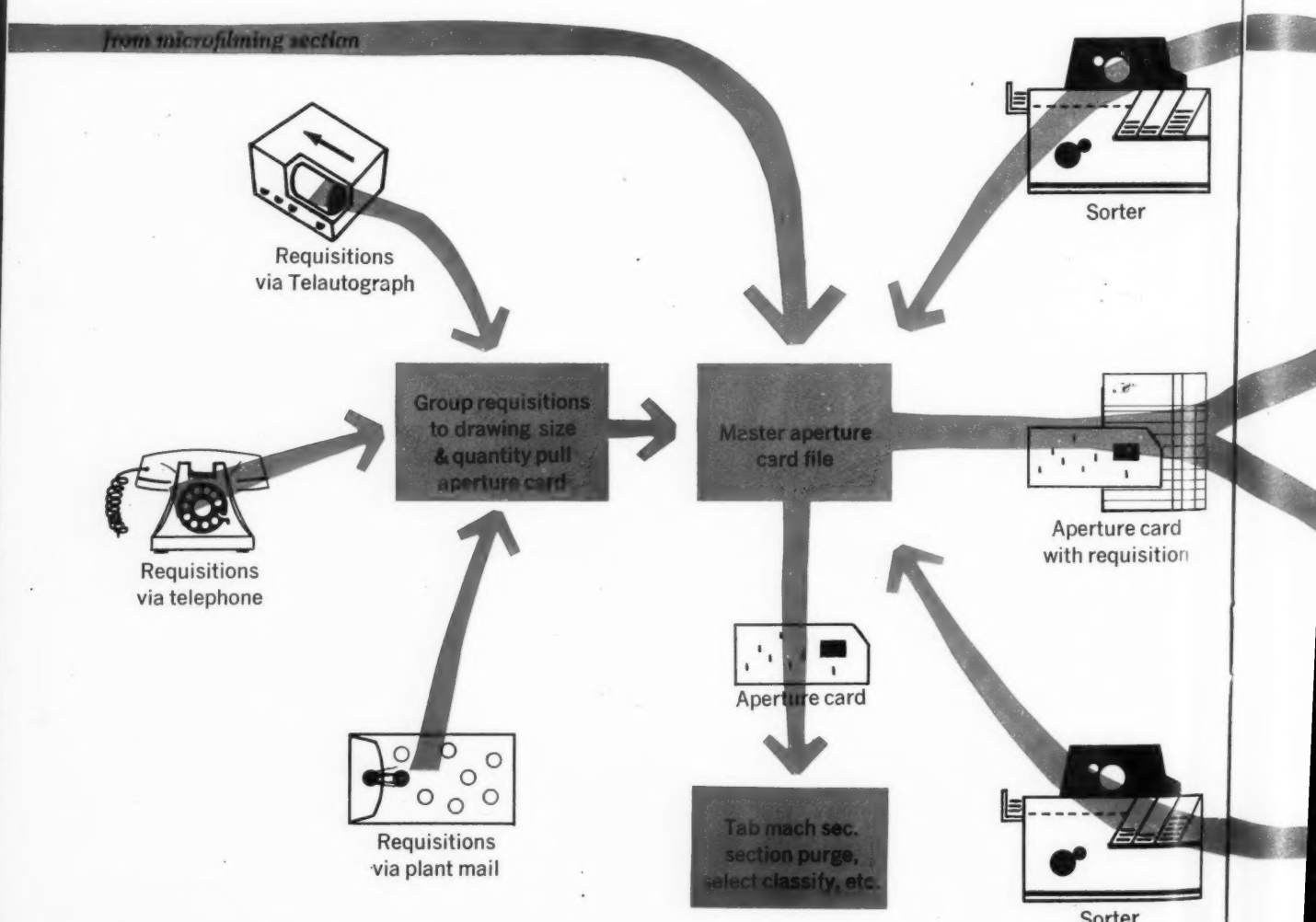

Shown here is the flow of work into Westinghouse's automated engineering drawing reproduction system. Not shown is the dispatching of a security roll of microfilm into a permanent storage vault. The original drawing, now made on tracing paper to pare costs, takes only a brief part in the cycle. It is photographed, used to make a master list of drawings microfilmed, used for punching aperture card data, then filed. The use of the active, microfilmed file is shown overleaf.

curity roll number in the sub-change space of the tracing itself; thus we have the reference index for previous subs in more permanent, more universal, more accessible form at less cost, and faster.

These fundamental considerations are being justified daily in our East Pittsburgh operation. We are realizing appreciable savings now and the total is growing in both rate and amount every day. Service has improved steadily. We have even had people call to request that we cancel the requisition they had just entered—because a print of the drawing they wanted had just mysteriously appeared on their desks. The mysterious prints, of course, were actually the fulfillment of their requisitions. Already we can see the advantages of engineering coding rippling out to the areas of greater standardization of product and shop practices, decreased tooling costs, shorter manufacturing cycles, and beyond this to increased asset turnover and greater return on investment.

How does our automated drawing processing system work? First, the drafting departments deliver a listing sheet and the listed new or changed tracings to our camera room. We stamp the security film roll number on each tracing and photograph it under a planetary camera, blending backlighting, top-lighting, filtering and masking according to the condition of the original tracing. We then make a conventional print before filing the tracing, which will be pulled only when changes are required. The conventional print is used to route and issue manufacturing information to our shop organization while our microfilm is being processed and mounted into IBM cards.

The completed aperture cards are then machine-sorted and hand-filed into a master aperture card file. A duplicate is sent to each involved engineering department for their reference file. As requisitions arrive, they are sorted into file order and the matching aperture card is pulled. The aperture

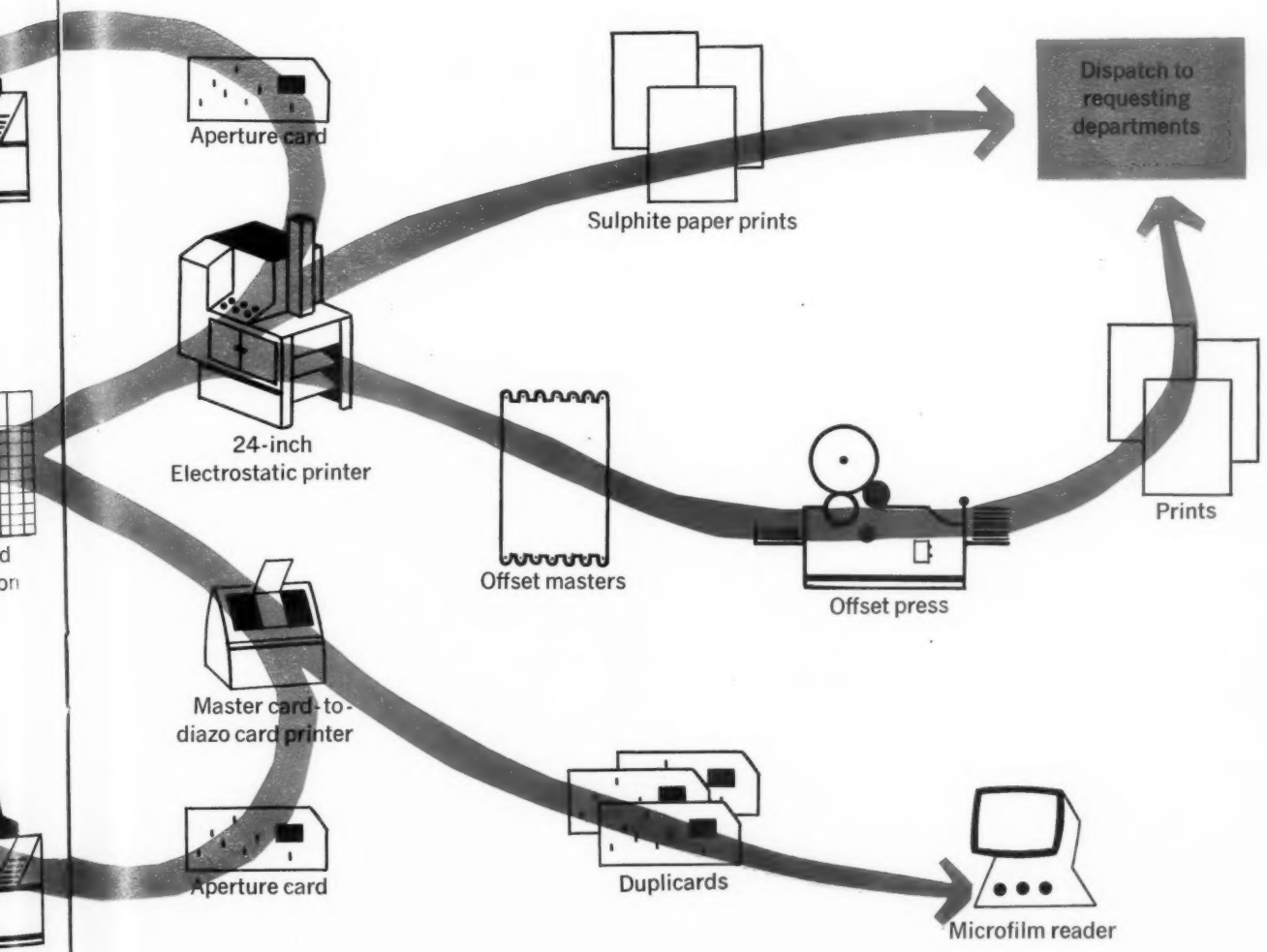


cards are fed into Copyflo® electrostatic printers, the required quantities of prints, on unsensitized paper, are made, cut, and stacked automatically.

We at Westinghouse have chosen what seems to be a unique approach to the unitized working microfilm program. For a score of years we had microfilmed tracings for archival purposes. But we did not unitize or automate our old files en masse. Rather, we have automated on the basis of current activity. Every new or changed tracing has been automated since July 1958; and beginning in January, we have been automating every tracing that has been pulled, not for change, but for prints. We think this is the right way to approach the problem. It appears that we will wind up with a complete active file less than half the size of the original 500,000 estimate. Most print-request activity in an industrial operation such as ours is confined to (1) new and changed or (2) "perennial favorite" drawings. To date, we have automated 15 per cent of our old tracing file, from which we are producing more than 85 per cent of our current print-requests. This approach is providing us an uncluttered but complete aperture card file.

What about our tracings? Are they neat, clean tracings prepared with working micro-reproductions in mind? They most emphatically are not, and therein lies the greatest encouragement we can give you. We are working with tracings from the nineteenth century, tracings that have endured complete submersion during floods, and tracing reproductions of almost every known variety, most of which have seen better days. Do we redraw them to make satisfactory microfilms? We do not. Our basic policy requires that if our previous drawing reproduction process can produce a satisfactory print, our automated process must do likewise. And we are succeeding amazingly well.

What have we learned at Westinghouse that might help the industry? (*continued on page* 86)



# CIRCUITS MADE TO ORDER

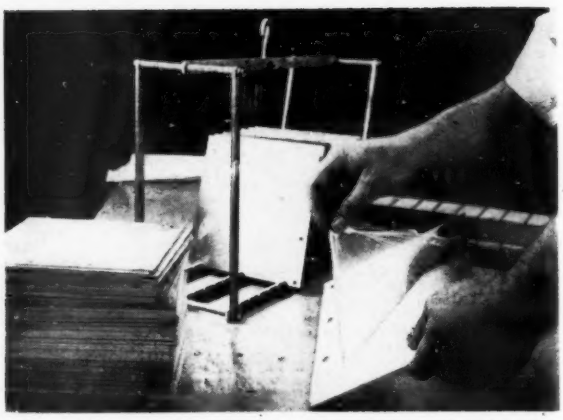
**Photo templates speed circuit production for computer maker**

Computers are almost as smart as people but are harder to manufacture. Unlike people, who arrive pre-assembled with components miniaturized for shipment, a computer has to be assembled full size with intricate circuits to do its thinking for it. With the increased demand for brains, both human and mechanical, old methods of assembling computers by hand were just not fast enough to meet this demand. The problem was to find a method of computer circuit assembly which was faster than the old method, yet as accurate, and still be economical.

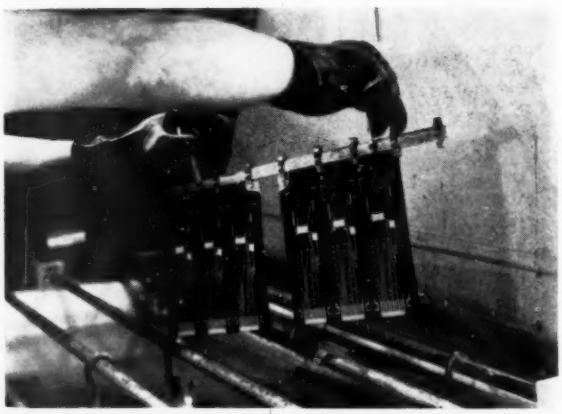
Librascope, a Glendale, Calif. subsidiary of General Precision Equipment, specializing in computers and similar complex electro-mechanical gadgets, solved the problem for themselves by using a semi-automated assembly line. Basis of the operation is the printed circuit. Circuits are printed and the components inserted into the printed boards by automatic machine. Constant inspection at every stage ensures complete accuracy when the circuits are inserted into the computers. According to the company, the rate of production is higher and rejection lower than with former hand-assembly methods.

The process starts with the "sandwich" of copper clad epoxy glass laminate plastic which Librascope purchases from outside producers. After visual inspection, the boards are cut to size and punched for two location holes which serve to register the board accurately through all succeeding operations. The protective coating is removed and the boards cleaned to remove grease, impurities and other surface dirt. After a final degreasing, the boards are inspected and then stored in dust-free, humidity-controlled cabinets.

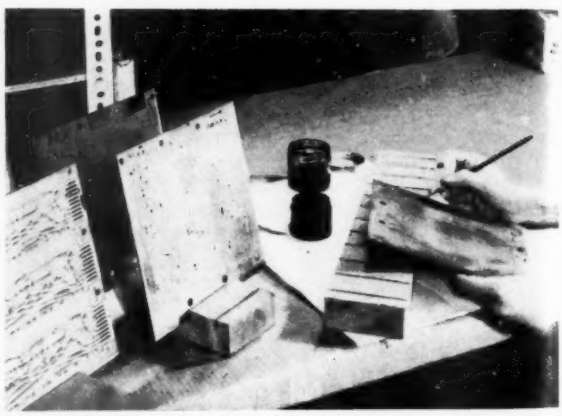
The road to the computer's brain begins with a dip into a photo-sensitive emulsion resist, after



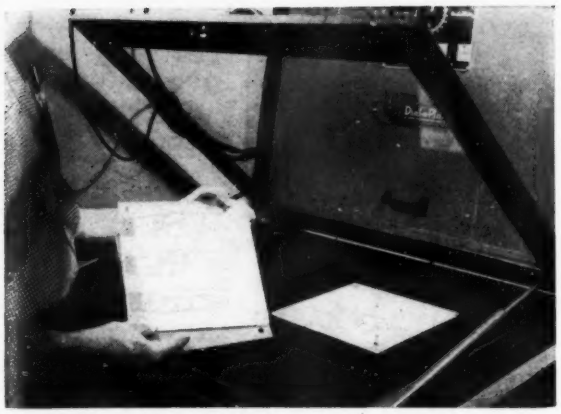
**Protective vinyl** coating is stripped from boards prior to printing. Librascope gets boards in blank from suppliers, inspects them, punches register holes for accurate placement during subsequent manufacturing operations.



**Vapor degreasing** after exposure removes photo resist from unexposed areas, hardens resist in exposed sections. A special dyeing technique, using black dye, makes printed board easier to see, makes flaws easier to spot.

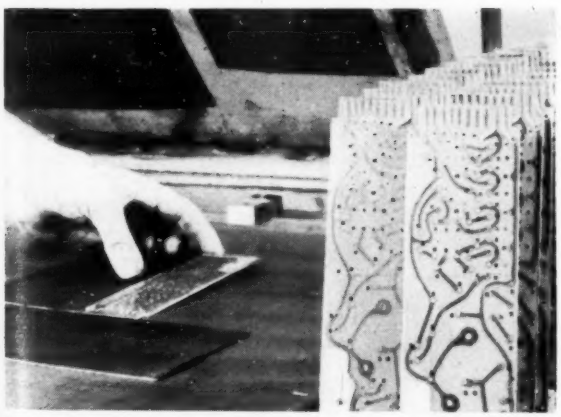


**Repeated washing** and rinsing prevent contaminants from being carried over from one operation to the next. In addition to repeated washings, inspections at each stage reduce rejects after boards are completely assembled.



**Semi-automatic printing** machine is used. Photo templates and sensitized boards are held by vacuum frame during precisely timed exposure. For dimensional stability, the paper plate is glued to transparent plastic.

**Retouching** with special staging ink corrects imperfections after solder plating process. Should more than a minimum amount of retouching be needed, plates are scrapped. From here, plates enter chromic-sulphuric acid etching bath.



**Silk-screen process** prints code letters marking the location of each component on board, for both assembly and future service operations. By now, boards have been cut, drilled to exact size ready for components.

which the boards are air dried and baked in a 160°F oven, then stored in dust-proof cabinets until needed. When they are needed, another inspection is made before they are used.

After baking, the boards are ready to receive the photo template. These are made on translucent paper which is glued to a transparent acrylic plastic to improve dimensional stability. The plastic backing has two locating pins which fit into the register holes on the board.

In printing, the boards and photo templates are inserted into a vacuum frame and exposed, the time being controlled by a pre-set clock.

After exposure, the unexposed photo resist is removed. However, the resist which was exposed is hardened. A special dying technique, using black dye, is used to make the faint circuit pattern more visible. At this point, retouching is used to correct minor imperfections. Boards with major defects are rejected.

Solder plating is the next step, providing a durable etching resist for developing the final pattern and aiding the dip soldering operation. Another inspection and retouching operation is made during this phase.

The etching process, using a chromic-sulfuric acid solution, eats away the copper portions of the board, leaving the solder coated parts untouched. The etching action continues until the plastic base is reached. The result is a precise circuit pattern. Exact temperature control prevents over-etching.

After etching, mechanical rinsers remove the etching solution and after another inspection, the boards are ready for nickel-rhodium plating. This plating minimized abrasion and corrosion. After a final scrubbing and inspection, the boards are now ready for fabrication.

The necessary holes, as many as 100 to a board, are drilled into the board which has now been cut to exact size. A washing and inspection follows the drilling. Silk-screen printing is now used to mark the location of all components, both for assembly and replacement after the computer leaves the plant.

Automatic machines install eyelets, the five machines doing as high as 60,000 per shift. A Dynasert machine inserts components—resistors and diodes ranging in size from .4 to .8 in.—automatically. These components are then prepared for a solder dip, with temperatures from 475°F to 500° depending upon the type of deposit needed. By now, all components are connected to the printed circuits and the boards are ready to be assembled in computers. Another brain is on the way. The automated circuit board assembly section at Librascope occupies approximately 6000 square feet and employs about 50 people.—THE END

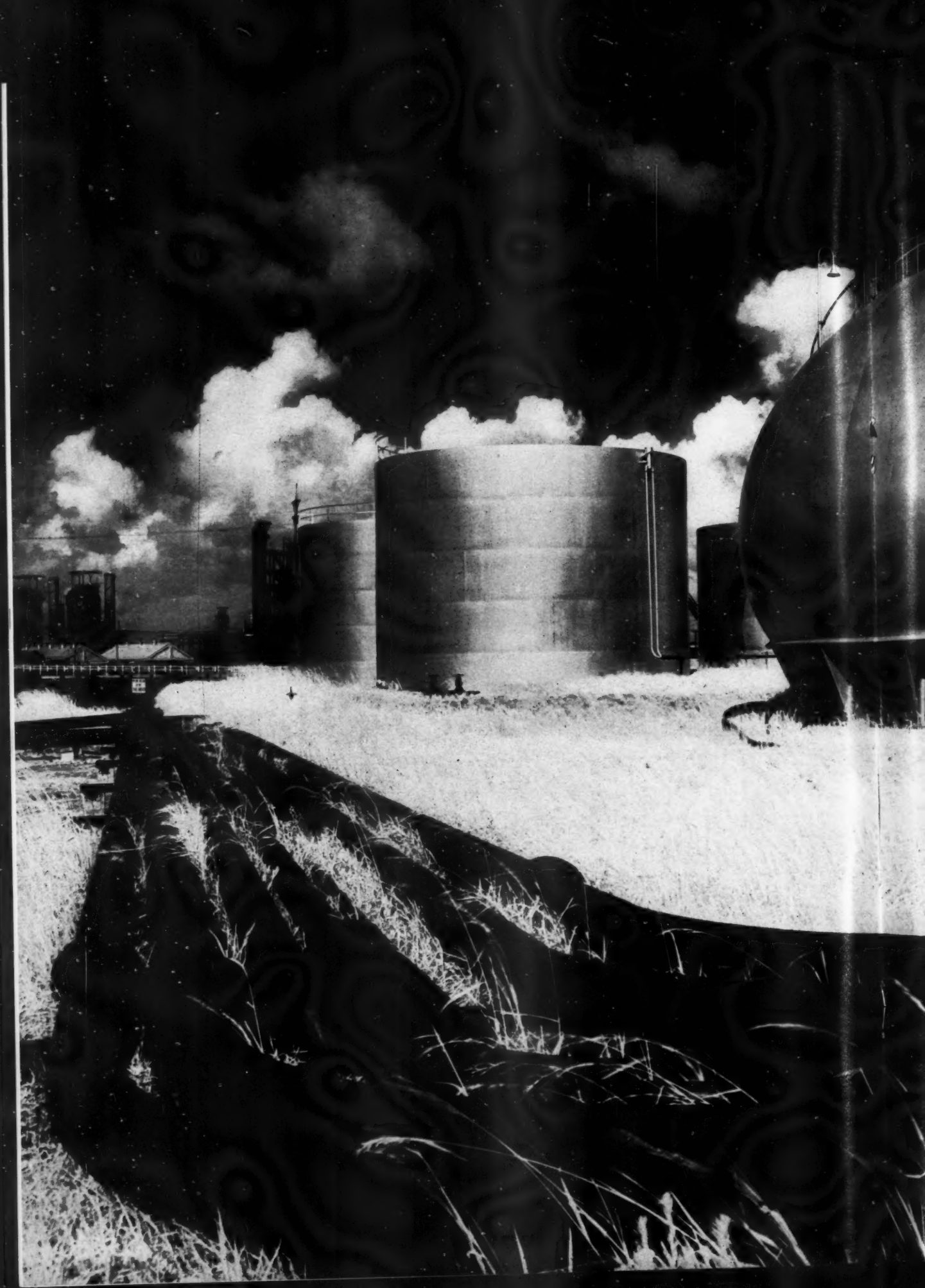
# DIMENSIONAL STABILITY

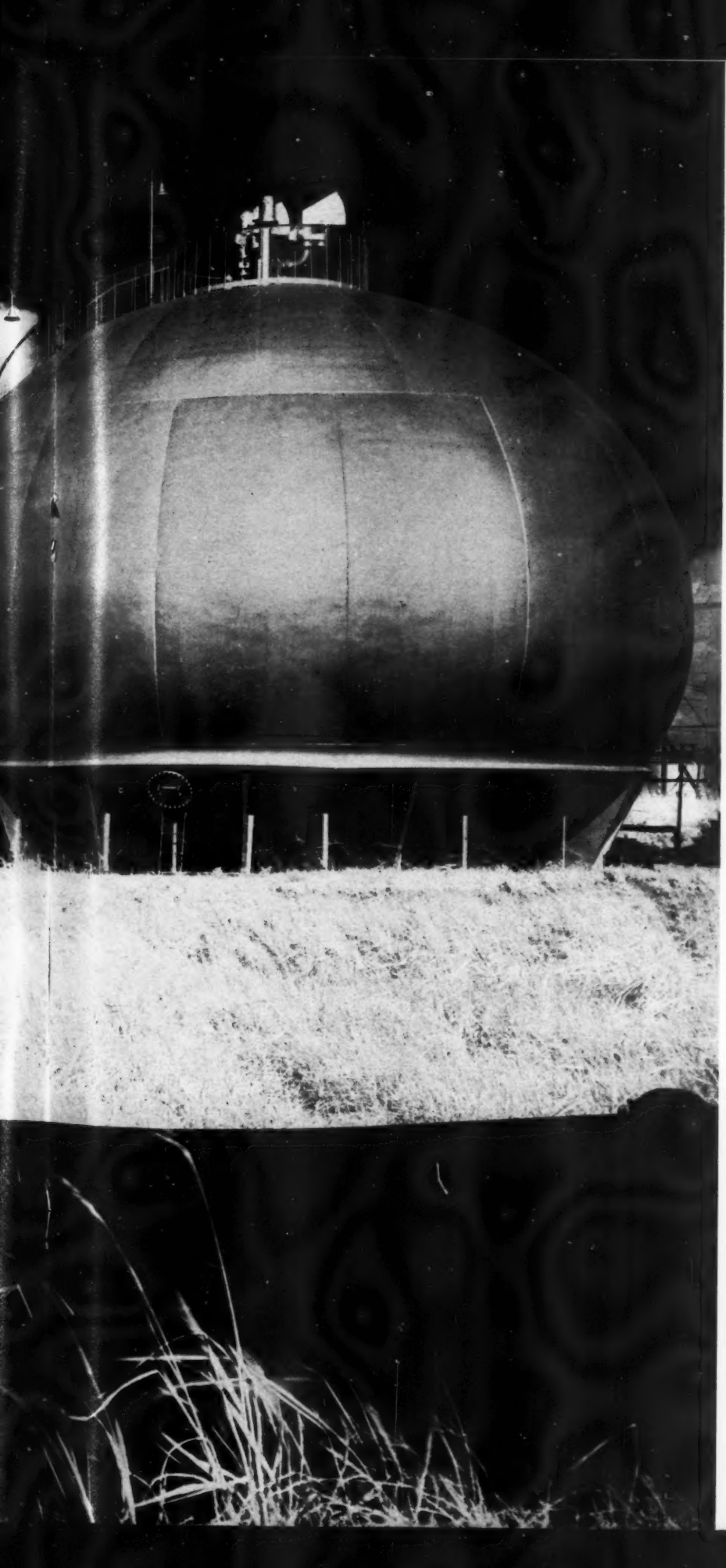
**Neither heat, cold nor damp of day can sway these films from the straight and the true. Coated on polyester and polystyrene bases, these materials are a must whenever accuracy is a prime factor.**

| TRADE NAME | COATING | BASE | COST PER SQ. IN. (per 100 sheets of smallest stock size) | IMAGE COLOR | THICKNESS | LIGHT TRANSMISSION | AVAILABLE SIZES |
|---|---|---|---|---|---|---|---|
| **CHARLES BRUNING COMPANY, 4700 Montrose Avenue, Chicago, Illinois** | | | | | | | |
| Copyflex Sure-Scale Type M | Diazo | Mylar | .0042¢/ft. *(.003" material)* | Sepia | .003" & .005" | Translucent *(one side matte)* | Cut sheets – any size; rolls in 10, 20 yd. lengths, 36", 42", 48" wide. |
| Sure-Scale Type M Wash-Off | Silver *(wash-off)* | Mylar | .00543¢/ft. | Black | .003", .005" & .0075" *(spec.)* | Translucent *(one side matte)* | Rolls – 30", 36", 42" wide in 10, 20 and 50 yd. lengths |
| Cronaflex Contact or Projection | Silver | Cronar | .00373¢/ft. *(.004" material)* | Black | .004" & .007" *(special)* | Translucent *(matte finish)* or Transparent *(.004" base only)* | Cut sheets – any size; Rolls – 24", 30", 36", 42" wide, in 50, 100 foot lengths. |
| Cronaflex Direct Positive | Silver | Cronar | .00373¢/ft *(.004" material)* | Black | .004" & .007" | Translucent *(matte finish)* | Cut sheets – any size; Rolls – 24", 30", 36", 42" wide, in 50, 100 foot lengths. |
| **EUGENE DIETZGEN COMPANY, 2425 N. Sheffield Ave., Chicago, Illinois** | | | | | | | |
| Perma-Scale Film, F203-7 | Van Dyke | Mylar | Under one cent | Dark Brown | .008" | Translucent | All sizes up to 48" wide in any length. |
| Perma-Scale Film, F204-7 | Diazo | Mylar | Under one cent | Sepia, Black, Blue | .008" | Translucent | All sizes up to 48" wide in any length. |
| **E. I. DU PONT DE NEMOURS & COMPANY, Wilmington, Delaware** | | | | | | | |
| Cronar Low Gamma Pan | Silver | Cronar | Not available | Black | .007" | Transparent | Standard roll, sheet sizes |
| Cronar Masking | Silver | Cronar | Not available | Black | .004" | Transparent | Standard roll, sheet sizes |
| Cronar Commercial | Silver | Cronar | Not available | Black | .007" | Transparent | Standard roll, sheet sizes |
| Cronar Ortho A Lith | Silver | Cronar | Not available | Black | .004" & .007" | Transparent | Standard roll, sheet sizes |
| Cronar Pan Litho | Silver | Cronar | Not available | Black | .004" | Transparent | Standard sheet sizes |
| Cronar Pan Masking | Silver | Cronar | Not available | Black | .004" | Transparent | Standard sheet sizes |
| Cronar Reflection | Silver | Cronar | Not available | Black | .007" | Transparent | Standard sheet sizes |
| Cronar Transparency | Silver | Cronar | Not available | Black | .007" | Transparent | Standard sheet sizes |
| Cronaflex Direct Positive; Contact; Projection | Silver | Cronar | Not available | Not available | .004" & .007" | Transparent | Standard roll, sheet sizes in both thicknesses |
| **EASTMAN KODAK COMPANY, 343 State Street, Rochester 4, New York** | | | | | | | |
| Kodalith Ortho PB Film, Type 3 | Silver *(photographic)* | Poly-styrene | Not available | Black | .005" | Transparent | All standard sheet, roll sizes |
| Kodalith Ortho PB Film, Type 3 *(thick base)* | Silver *(photographic)* | Poly-styrene | Not available | Black | .010" | Transparent | All standard sheet, roll sizes |
| Kodak Autopositive | | Poly- | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kodalith Ortho PB Film, Type 3 | Silver *(photographic)* | Poly-styrene | Not available | Black | .005" | Transparent | All standard sheet, roll sizes |
| Kodalith Ortho PB Film, Type 3 *(thick base)* | Silver *(photographic)* | Poly-styrene | Not available | Black | .010" | Transparent | All standard sheet, roll sizes |
| Kodak Autopositive PB Film | Silver | Poly-styrene | Not available | Black | .005" | Transparent | Rolls – 20", 40" x 100'<br>Sheets – 10 x 12; 20 x 24 |
| Kodak Separation Negative PB Film | Silver *(photographic)* | Poly-styrene | Not available | Black | .005" | Transparent | Standard sheet sizes, 4 x 5 to 20 x 24 |
| Kodak Commercial PB Film | Silver | Poly-styrene | Not available | Black | .005" | Transparent | Standard sheet sizes, 8 x 10 to 20 x 24 |
| Kodak Pan Masking | Silver | Poly-styrene | Not available | Black | .005" | Transparent | Sheets: 4" x 5" to 11" x 14" |
| **GEVAERT COMPANY OF AMERICA, 321 West 54th Street, New York 19, N. Y.** | | | | | | | |
| Gevaert Litholine Ortho O 82p, O 84p | Silver | Poly-styrene | Not available | Black | .006" *(O 82p)*;<br>.010" *(O 84p)* | Transparent | Standard roll, sheet sizes |
| Gevaert Graphic Pan P 32p | Silver | Poly-styrene | Not available | Black | .006" | Transparent | Standard roll, sheet sizes |
| Gevaert Backing Pan P 24p | Silver | Poly-styrene | Not available | Black | .010" | Transparent | Standard roll, sheet sizes |
| **GRANT PHOTO PRODUCTS, INC., 19000 Detroit Avenue, Cleveland 7, Ohio** | | | | | | | |
| Registrite *(Linecopy, Litho)* | Silver Halide | Mylar | .0375 cents | Black | .004" | Translucent | Up to 42" wide in any length |
| **ILFORD, INCORPORATED, 37 West 65th Street, New York 23, N. Y.** | | | | | | | |
| Fine Grain Ordinary Series 2 | Silver *(non-color sensitive)* | Poly-styrene | Not available | Black | .010" | Transparent | Standard cut film sizes |
| **KEUFFEL & ESSER COMPANY, Adams and Third Streets, Hoboken, New Jersey** | | | | | | | |
| Herculene | Pencil Surface | Mylar | 15.6¢/square foot | Not available | .0025" to .0080" | Translucent | Cut sheets – any size; Rolls – 30", 36", 42", 54" wide |
| Stabilene | Dupro, Diazo & Maduro in both Pencil & Ink & Scribe Surfaces | Mylar | Not available | Various depending upon type of sensitization | .003", .005", .0075" | Available in Translucent, Transparent and Opaque | Cut sheets – any size; Rolls – 36", 42", 48" wide in 20 yard lengths |
| Photoact | Silver | Polyester | .00318¢/Sq. inch | Black | .0035" | Transparent | Cut sheets – any size; Rolls – 30", 36", 42" wide |
| **OZALID DIVISION, GENERAL ANILINE & FILM CORPORATION, Binghamton, New York** | | | | | | | |
| Duratrace | Unsensitized | Mylar | .00125¢/sq. inch & up depending upon thickness of base. | Not applicable | .002", .003", .005" & .0075" | Translucent | Standard sheets, roll sizes |
| Scalemaster | Diazo | Mylar | .0030¢/sq. inch and up | Sepia | .003", .005", .0075" | Translucent | Standard sheets, roll sizes |
| **FREDERICK POST COMPANY, P. O. Box 803, Chicago 90, Illinois** | | | | | | | |
| Vapo Tuf-Tex, Post No. 208PE | Diazo | Mylar | .0033¢ | Black | .0045" & .0065" | Translucent | Cut sheets – any size;<br>Rolls – 30", 36", 42" wide |
| Repro-Film, Post 229PE | Wash-Off | Mylar | .0043¢ | Black | .0045" & .0065" | Translucent | Rolls – 30", 36", 42" wide |
| **NORMAN WADE COMPANY, LTD., 891 Yonge Street, Toronto, Ontario, Canada** | | | | | | | |
| Duraline | Diazo | Mylar | 45¢ per square foot | Sepia or Blackline | .003" & .005" | Translucent, matte on both sides | Cut sheets – any size;<br>Rolls – 36", 42", 48" wide |

This chart is incomplete, same data arriving too late for inclusion here. Additional information on page 88. Cronar and Mylar are Du Pont trademarks for their polyester base, the former for photographic use, the latter for graphic arts. For complete information, consult manufacturers of materials listed.





# ROBERT YARNALL RICHIE

**A top man in a tough field, Bob Richie knows and thinks industry, will tackle any project anywhere and at any time**

Among other advantages, railroads offer comparatively uneventful transportation, but on occasion they do suffer from spectacular mishaps. One such event occurred on the New York, New Haven and Hartford Railroad near Brewster, N. Y. some 35 years ago. Summoned to the scene was the road's examining physician, who came acompanied by his 15-year-old son, an amateur photographer who took pictures of the debris. With astute commercial instinct, the young photographer gave his undeveloped film to a friendly trainman with a request that it be delivered to the New York *Daily News*. The delivery was made, the pictures were used and $10 duly delivered to Robert Yarnall Richie who had made his first sale.

Despite this initial coup, Richie remained an amateur, being content to seek his "first ten thousand" in such areas as selling construction material, country club management and real-estate, the latter working for E. M. Davis, one of the more successful real-estate operators of the late 20's and early 30's. It was while working for Davis that Richie began to be more than an amateur.

"We needed some aerial shots of various properties and we received an estimate of $125 from Fairchild Aerial Surveys which was quite a lot of money in those

*July 1956: Oil refinery, Port Arthur, Texas, for Gulf Oil Co.*

days. I figured I could do the job much cheaper so I promoted a Fairchild aerial camera on a trial basis, went out to Armonk, N. Y., to Westchester County airport, and rented a Fleet trainer. I had held a pilot's license since 1930.

"Anyway, the first shots were pretty bad—I was too high and did not use a filter. I went back again and finally got good pictures. While doing this job, I had an idea of taking aerial photos of some of the estates located along the Hudson. I took pictures of the Gimbel estate among others but Mrs. Gimbel did not want to buy any. At that time, she was confined to bed after a riding injury, so I took the picture and had it made into a jig-saw puzzle. They were the rage those days. Well anyway, when I came to the house I guess the butler thought I was a friend and when I gave him the box with the picture-puzzle, he showed me in. Mrs. Gimbel bought it and I started selling some of my aerial photographs.

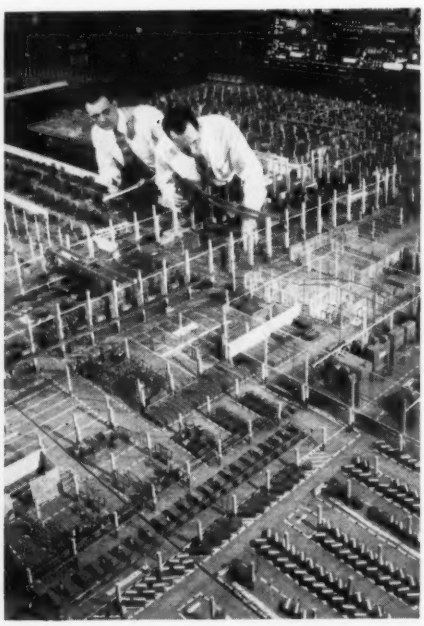
"In aerials, though, the money is in repeat business. *Town & Country* used pictures of the estates. I took a series of Eastern prep schools—Andover, Groton, Exeter, etc.—and Rogers Peet designed back-to-school window displays around these pictures which were enlarged to mural size.

"The point was reached where I was doing more photography than real estate, so I went on my own. The first couple of years were hard, but gradually I built a reputation for aerial work. One way was to do as much editorial work as possible. Editorial work does not pay as much as advertising, but in terms of providing a showcase for a photographer's work, it is invaluable.

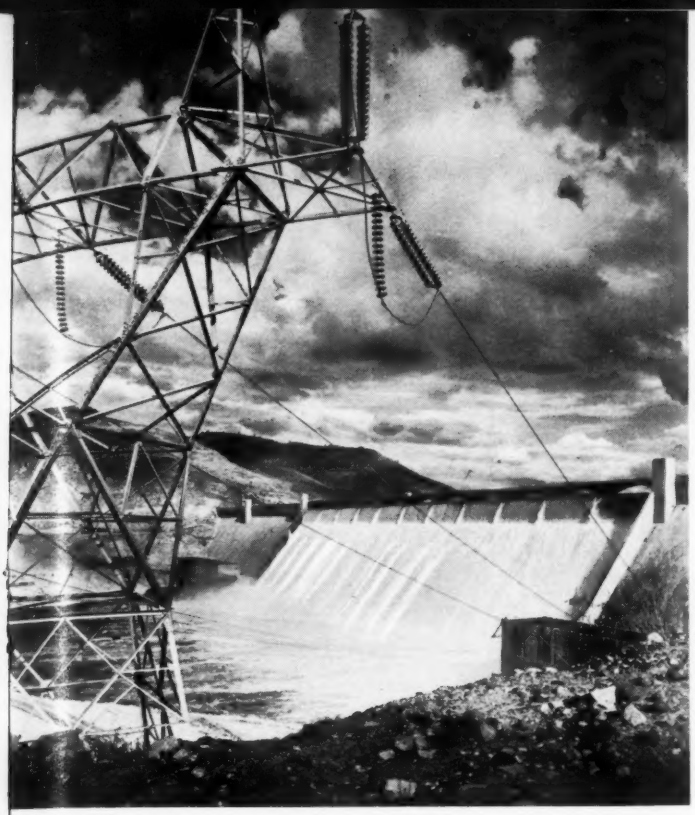
"Anyway, I began getting assignments from various advertising agencies and magazines. About 1936, I met Margaret Bourke-White. She borrowed my camera, my helmet and my goggles to do an aerial job.

"All of us in the industrial field owe that girl a lot. She was the first to awaken business to the drama and beauty of an open hearth furnace, the humble smoke stack or nut and bolt. She made it a lot easier for all of us who followed her. Anyway, she returned the camera and the helmet, but kept the goggles as a souvenir. We got friendly and decided to share

(*continued on page 89*)

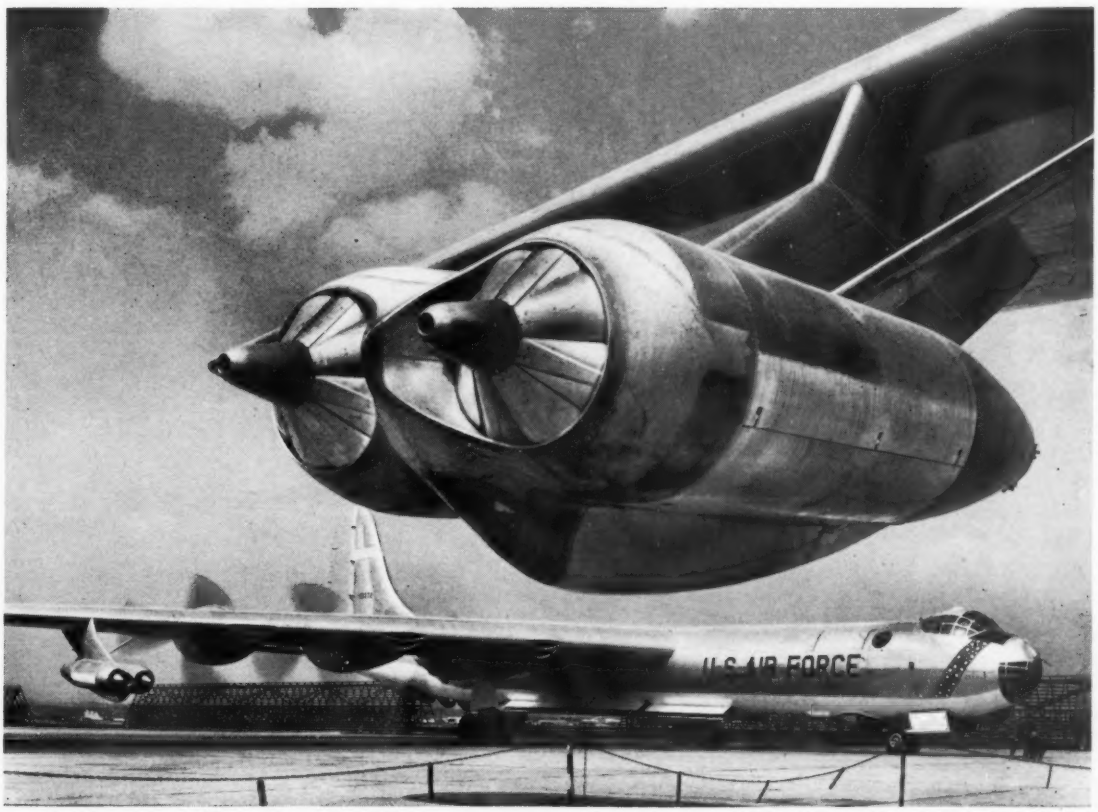


*Good story-telling photo shows GM engineers studying model assembly line in Lansing, Mich. Shot (right) was in Lehigh Valley yards, Hoboken, as experiment during job for American Association of Railroads.*



*Aug. 1944: Grand Coulee Dam for Allis-Chalmers.*

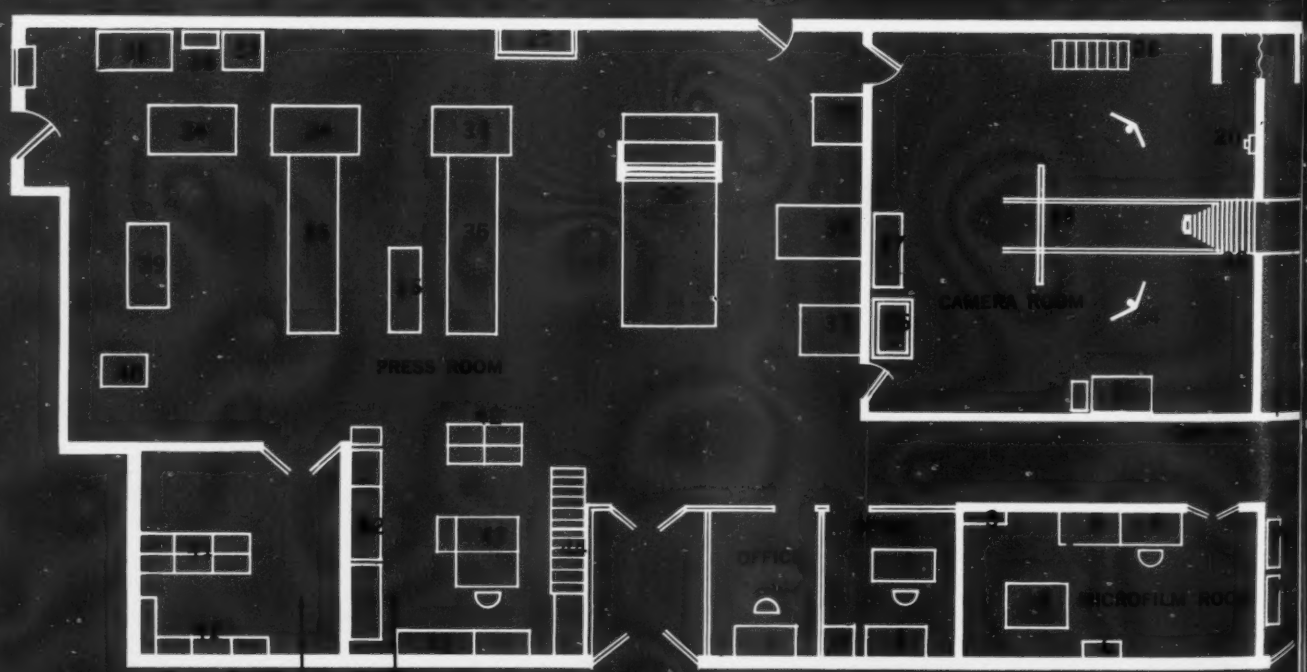
*May 1957: Wind tunnel, Langley Field.*




*May 1955: B-36's, Fort Worth, Texas. Made as calendar photo for Schlumberger Company.*

# SIKORSKY AIRCRAFT

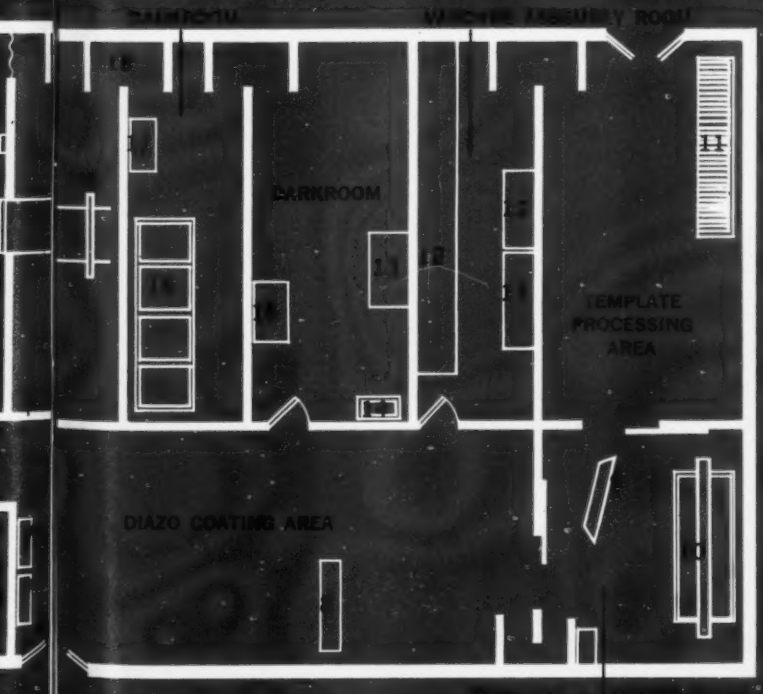
**Sikorsky's repro department headed by Roland G. Blankley *(seated right)* started with three diazo machines in 1955, today occupies 10,000 sq. ft., has saved as much as a quarter million dollars in a five-month period. Angelo Aquilante *(left)*, Supervisor of Reproduction, and Owen Backus *(center)*, Asst. Supervisor of Drawing Services help run show with staff of 21**



At Sikorsky Aircraft helicopters are designed for vertical take-offs; recently the plant's reproduction department growth has shot up in the same direction. Several years ago the department was capable only of producing a diazo print of an engineering drawing. All other forms of reproduction were either purchased outside or unheard of. A year ago last July the Reproduction Group moved into its new quarters in the new airconditioned Engineering Building at Stratford, Conn. It occupied 10,000 sq. ft. of space. The first two large pieces of equipment installed were a Lanston Monotype camera built to fit Sikorsky's requirements and a Steinmesse and Stollberg Dufa VI flatbed proof press, it weighs three tons. Today the department is capable of handling all of the company's reproduction jobs including diazo, photo offset, photo copy, template reproductions, microfilm processes as well as the printing of engineering reports and promotional material.

Key man in the department, officially designated the Engineering Drawing Services Group, is Roland G. Blankley, whose official title is Supervisor of Drawing Services. A civil engineering graduate of the University of New Mexico, Blankley is chairman of the Connecticut chapter of the Society of Reproduction Engineers. He has had various positions in the aircraft industry as staff accountant and in cost control and cost quotation. He took over the reproduction department in 1955 as a side line job because at that time there were only three Diazo machines. Now the department has 24 on the payroll including Blankley and his two supervisors. The staff includes one secretary, a microfilm camerman, three process cameramen, one platemaker, one set-up opaquing clerk, two small offset press operators, two pressmen for the Dufa VI press, three diazo operators, one loft repro man and six persons who handle print pulling and distrubution of reproduced material. It is important to note that with the exception of the two supervisors, Owen Backus and Angelo Aquilante, none of the present personnel had any previous experience in photography or reproduction of any kind. They have all been trained at Sikorsky.

The heart of the photo reproduction operation centers around the large SS Dufa press and the Lanston camera. In the past few years Sikorsky's bill for reproduction of engineering drawings had been approaching a half million dollars per year. Biggest cost factor is the large number of drawings

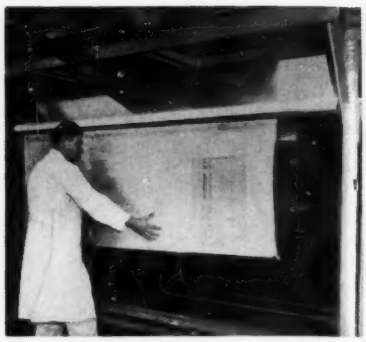



## Sikorsky's Photoreproduction Dept.

1 Desk 2 File 3 File 4 Microline Camera 5 Table 6 Cabinet 7 Uncoated Metal Stock 8 Dietzgen Roller Coater 9 Arc Lights 10 Brown 5' x 12' Vacuum Frame 11 Developing Rack 12 Tables 13 Table 14 Copy Box 15 Headliner 16 Lesdal Sinks 17 Mixing Tank 18 Light Trap 19 Vacuum Camera Back 20 Essar Light Integrator 21 Curtain 22 Lanston Monotype Camera 23 Transoction Copy Frame 24 Arc Lights 25 Table 26 Light Table 27 Table 28 Negative Drying Rack 29 Dryer 30 Vacuum Frame 31 Table 32 Steinmesse and Stollberg Dufa VI Flatbed Proof Press 33 Plate Developing Sink 34 Diazo Machine 35 Table 36 Paper Cutter 37 Paper Punch 38 Cabinet 39 Multilith 2066 Press 40 Ben Hin Lithomatic Press 41 Metal Shelves 42 Tables 43 Desk 44 Sorting Bins

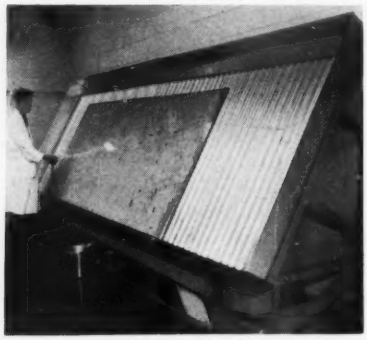
SIKORSKY (*continued*)

# IN-PLANT INNOVATIONS COMPLEMENT COMMERCIAL MACHINES

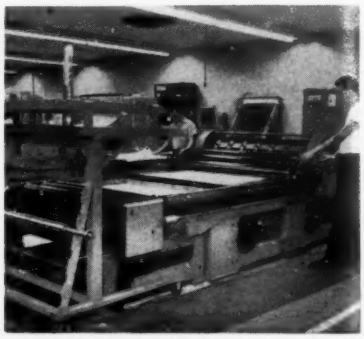


Robert Schultz adjusts copy at vacuum copyboard of Lanston camera

5 x 12-ft. vacuum frame used for loft reproductions, second originals.



Another Sikorsky-made item is large developing rack for metal templates.

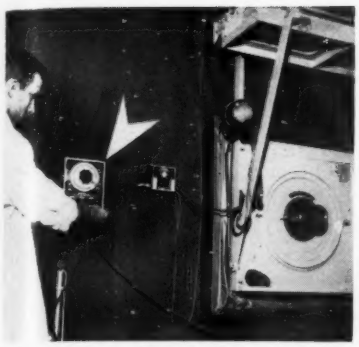


Dufa VI flatbed proof press with Sikorsky-designed paper rack

which must be revised to incorporate the numerous engineering changes made between conception of a product and completion of the standard production model. In order to supply the manufacturing areas, tool shops, experimental areas, spare parts departments, purchasing, production control, inspection, engineering, technical publication, service, tool and parts subcontractors and licensees with the necessary copies, as high as 50 copies of some drawings are required. Running these drawings at full scale on the diazo machines was devouring better than 12,000,000 sq. ft. of diazo paper a year. In order to reduce the cost of this operation some method had to be devised to reduce square footage and cut the cost of printing this reduced footage. The method chosen was to reduce all drawings 50 per cent in the Lanston Monotype camera and print on an offset press. The large camera will handle the largest drawing presently authorized by the engineering department (36 x 96 in.) or multiple quantities of the various smaller drawings (22 x 34 in. or 17 x 22 in.).

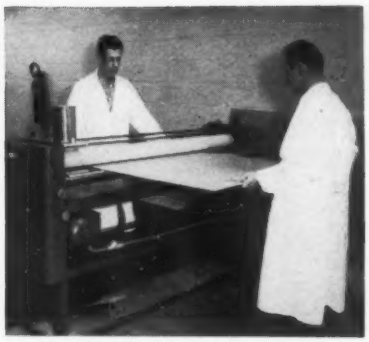
The camera itself is 28 ft. long and has a 60 x 100-in. "transuction" vacuum copyboard and a 5 x 5-ft. un-zoned vacuum back. It is equipped with a Goerz Red Dot 47½-in. Artar lens and a 24-in. Artar. Exposures are controlled by an Essar light integrator which consists of a timer coupled to the shutter and an electric eye on the copyboard. "The integrator has proved invaluable," says Blankley, "because it quickly regulates the exposure and ensures the same background density." When making halftone negatives the Essar integrator is used in conjunction with a densitometer and Kodak's Graphic Arts Exposure Computor. Two readings on the original picture, one on the highlight area to be copied plus one in the shadow area provide "instant information for the main and flash exposures," according to Blankley.

For three years the drafting room standards had been changed to call for larger scale details, larger lettering and better drafting in preparation for the possibility of using reduced scale prints. The list of materials and change blocks are typed on translucent, adhesive backed decal material and applied directly to the drawings. At the beginning of the operation, both Haloid Lithaloid film and paper negatives were used. Today, with increased skill acquired in their use, paper negatives are used almost exclusively. This is an almost 3:1



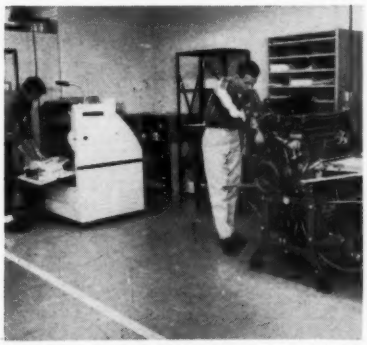
John Kwiatowski regulates Essar Integrator and flashing attachment

Marge Michlewski hangs negatives on Sikorsky designed drying rack



Vincent Siedlecki and Edward Nemergut diazo-coat with Dietzgen machine

William Sozanski operates air-powered paper cutter, modified metal shears



Banthin Lithomatic *(left)* and Multigraph 2066 handle small size work

savings in material costs as well as opaquing labor since the paper requires little or no opaquing. The opaquing that is necessary is done with Magic Marker for the paper negatives and Carter's Marks-A-Lot for films. These felt-nubbed marking devices are fast, cheap, clean, and non-spilling. Furthermore, they dry in an instant.

The reduced scale negatives are burned-in on 3M straight cut 40 x 60-in. pre-sensitized plates. A 40 x 60-in. Brown vacuum frame with a nuArc N110 arc light does the job. Both sides of the plate are used (only one side is guaranteed) and a minimum of two drawings are placed on each side. The plates are developed in the conventional manner, on a wooden rack in a sink.

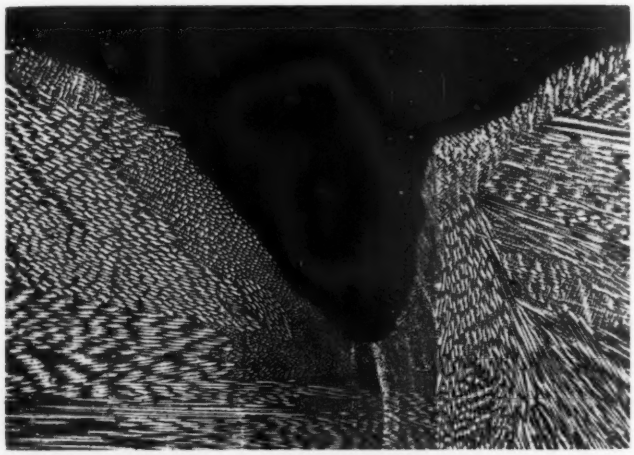
The Dufa VI flatbed proof press was moved in at approximately the same time as the camera. It measures 208 x 90 in. and can print about 230 sheets 36½ x 52 in. per hour. It has a motor-driven cylinder carriage, ink distribution and dampening device. A single lever clamping device facilitates changing plates, a foot-operated release for holding the paper. A two-man crew prints a sheet containing two or more drawings every 15 sec. Formerly the cylinder carriage carried a paper feed rack, but a stand was designed and built at Sikorsky to hold the paper in a more advantageous location. This released the area above the blanket for easier cleaning and general maintenance.

In cases where a drawing larger than 96 in. long must be reproduced, it is printed partly on the front and partly on the back of the paper. If a drawing is too long for even this procedure, an Ozalid Reversal Foil is made and the Reversal Foil is printed in the diazo machines.

At the end of each production run, two vellums are made. These are stored in the two widely separated engineering files for use as masters in running replacements in the diazo machines.

The matter of cutting up the 35 x 45 in. drawings presented a problem at first. The only equipment available was a Challenge 19 in. cutter and since the paper had to be cut down the 45 in. length a Simplex cloth cutter was purchased. This worked well but has now been replaced with a Sikorsky-modified machine which does the job even better: a foot-operated metal shears automated with air, with a replacement angle cutting blade and an added paper catcher. This unit has a capacity of 40 to 50 sheets per (*continued on page* 84)

**JON POWNALL,** Chicago, used a straight, "documentary" approach for this picture, made while en route to another assignment. Widely used during the thirties, this technique requires careful handling to be more than a record shot. Hasselblad.



**JAMES H. NASER** and **ROBERT TIMKO,** Metallurgical Lab, Jessop Steel Company, Washington, Pa., made this picture to show cavitation in a stainless steel weld overlay of a repaired carbon steel digester at 100X. The etchant was oxalic acid.

## PMI's Monthly

# READERS' SHOWCASE

### PMI's readers supply solutions to industrial photo problems

By popular consent we live in an age of specialization, with experts "knowing more and more about less and less." But his calling forces the typical industrial photographer to specialize in a little of everything, to fit the style to the subject and to handle a wide range of assignments with reasonable skill. This adaption of special styles to fit subject matter is found in this month's pictures.

Although all of these photos are industrial, by virtue of subject matter, the approaches demonstrated technique from fashion, journalism, documentary, scientific and from modern art. This diversity of approach brings us to the moral of our little story—to be a good industrial cameraman, don't study only technical manuals, but look at pictures, all types of pictures from paintings to photographs.

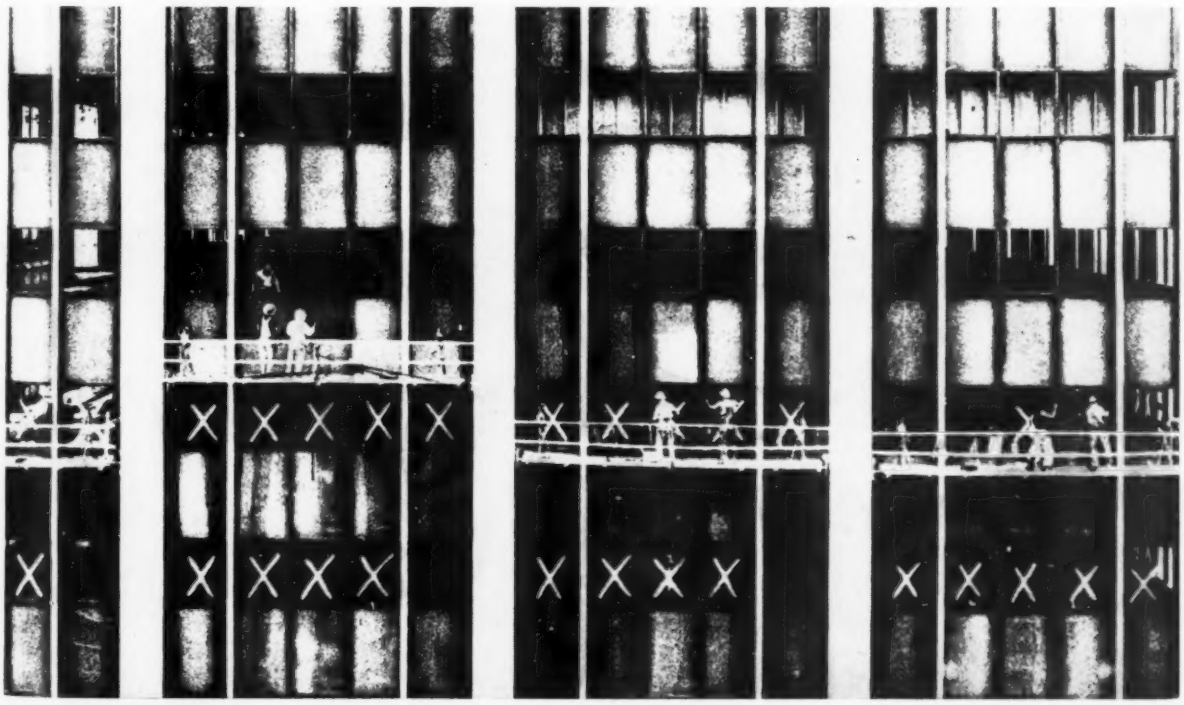
Some photographers can afford to specialize in one field but not the usual industrial man. He has to be fluent in a variety of pictorial tongues, to be able to tell his story in whichever style suits his subject best. In this field, too much specialization can mean not enough imagination.

**You are invited to send in your picture for this feature. Here are the details:**

There are two rewards for each of the pictures chosen. The first is knowing that your picture will be seen by appreciative fellow professionals. The second is $10.00. Please include your name and your company's name, a note about the picture and how it was used, and the technical data. Pictures cannot be returned unless a self-addressed stamped envelope is included. Send them to SHOWCASE, PMI, 33 W. 60, New York 23, N. Y.

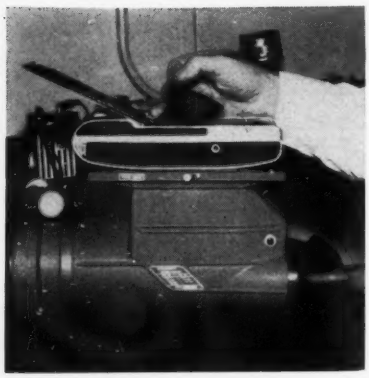
**WILLIAM FRAZIER,** Newark, N. J., used a photojournalist's approach to portray this office porter during a break. Frazier used a Mamiya 35mm camera, Panatomic-X processed in UFG. Exposure was f/5.6 at 1/100.

**ROBERT PACKO,** Toledo, Ohio, took a page from a fashion magazine to depict trucking in Toledo without showing any particular product. This picture is a result of motion, a slow shutter speed and panning. Hasselblad.



**RICHARD ALTHOFF,** New York City, achieved a geometric pattern similar to the work of both the cubists and Mondrian, the Dutch artist whose pictures are composed of straight lines and colored spaces. The effect of form was increased further by projecting on contrast process film, suppressing middle tones. The building, the new "Time-Life" unit in Rockefeller Center, was photographed on Ilford HPS film with a Rolleiflex and an f/3.5 Tessar. The exposure was 1/125 at f/16.

# POLAROID SLIDES SPEED TEST REPORTS



**STEP ONE:** Transient phenomena is recorded on Polaroid Land Projection Film with attachment on DuMont 302 oscilloscope camera two minutes after shutter is snapped.

**STEP TWO:** Technician attaches two-minute slides to 8½ x 11-in. sheets of clear acetate in actual location desired on test report pages the same day data is recorded.

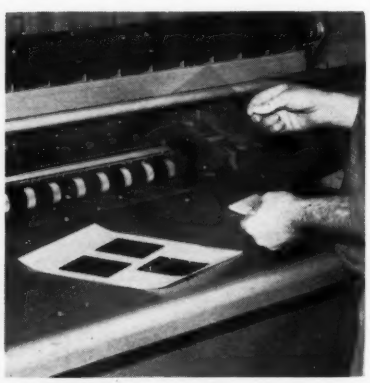
One of New England's largest manufacturers of precision transducers, Trans-Sonic's, Inc., of Burlington, Mass., has added a twist to the diazotype direct-copy process of reproducing illustrated test reports. The technique utilizes the Polaroid transparency system and enables them to turn out finished reports in jig time.

Several times during an instrument test it is necessary to record transient phenomena appearing on an oscilloscope screen. This data, which is recorded photographically, serves as graphic proof of the performance characteristics of the instrument being tested.

Prior to February 1957, Trans-Sonics used conventional slide film to photograph these oscilloscope patterns but the time required for processing by a local photo-finisher held up completion of the test reports by two-to-four days. Now, after test data has been collected and prepared in text form here's what can be accomplished in less than one day: Data is recorded on Polaroid Land Projection Film with a Polaroid back on a DuMont 302 oscilloscope camera. Two minutes after shooting a picture the cameraman lifts out a positive transparency which is then immersed in a small plastic container for 20 sec. to harden the emulsion. These slides, which are now ready for projection or reproduction, can be either 2¼ in. square or 3¼ x 4 in.

Transparencies and type-written material are 'cut' on diazotype master sheets and copies are reproduced in the firm's Revolute diazotype machine. The illustrated reports are then collated and ready for distribution to customers and engineers.

Trans-Sonic's has found this system to be economical with the estimated cost of reproducing each copy of an 80-page report at a little more than one cent per page. A single sheet of the diazo master paper runs about three cents and the cost of making a Polaroid slide is approximately 55 cents for materials alone.—THE END

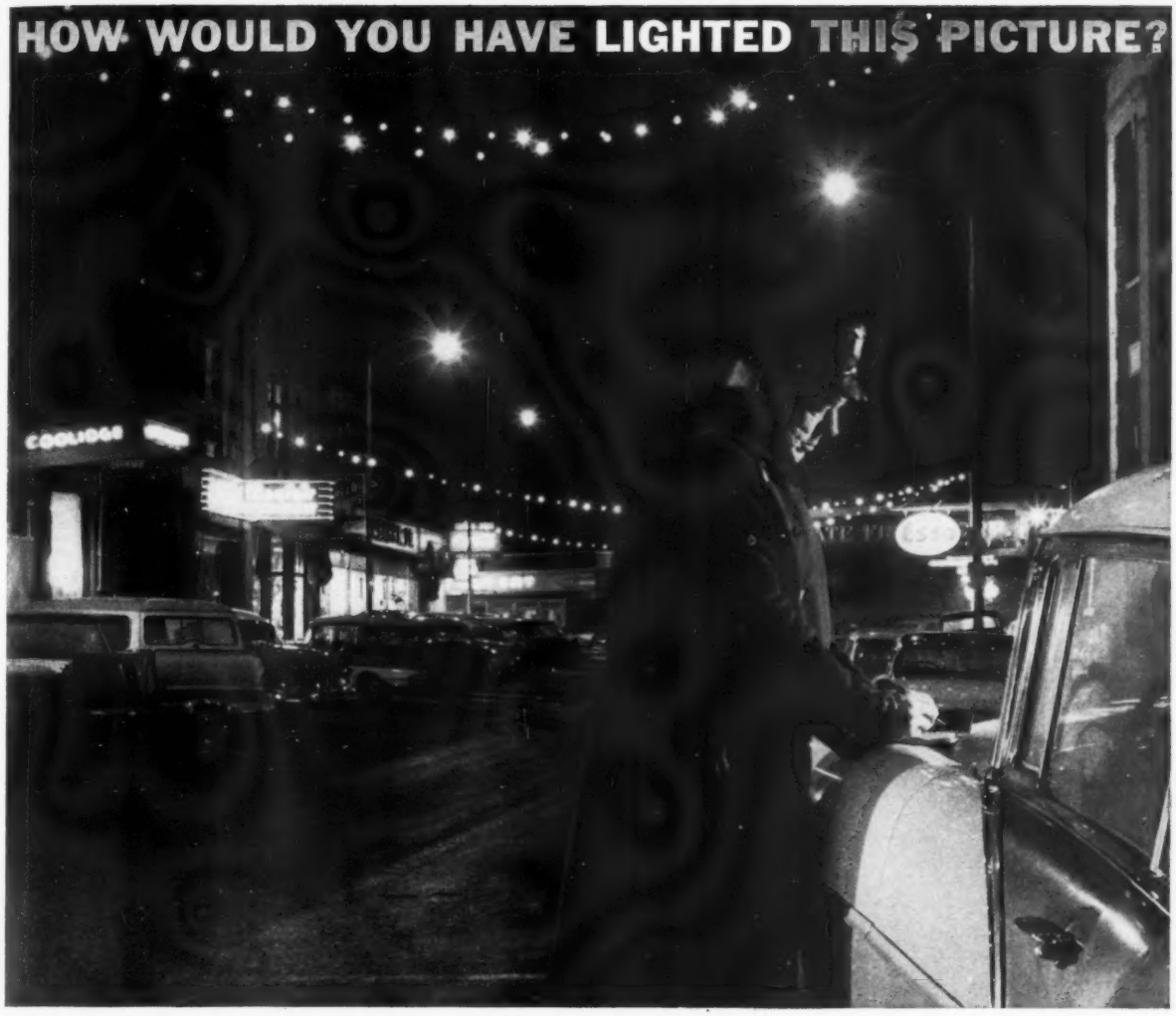


**STEP THREE:** Slides mounted on acetate are placed on top of sepia intermediate paper and fed through diazotype machine. Machine operator compares sepia with original.

**STEP FOUR:** Additional material prepared by engineers is typed directly on sepia master sheets. Opaque orange carbon paper placed behind sepia adds density to letters.

**STEP FIVE:** Actual test report is reproduced through diazotype machine. Pages are collated and finished reports, averaging about 80 pages, are bound in stiff cardboard binders.

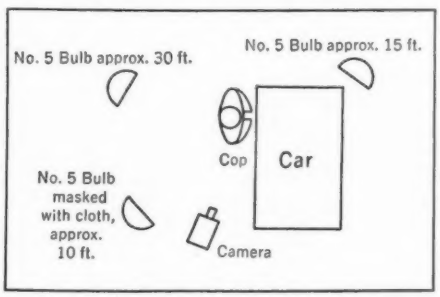
# HOW WOULD YOU HAVE LIGHTED THIS PICTURE?



## NEWS PHOTOGRAPHER DAVID MATT FINDS G-E No. 5 FLASHBULBS JUST THE TICKET FOR LIGHTING DRAMATIC NIGHT SHOT

"Last winter while doing a picture story on people who work nights in White River Junction, Vermont," says David Matt of the *Valley News*, "I took the above photograph. My problem here was to preserve the night effect and still have enough detail in the darker areas to reproduce in our paper. I also wanted to stop down, so that the lights in the street would have the sunburst pattern.

"My solution was to set my Rolleiflex on a tripod and use f/22 on bulb with a locking cable release. I then fired three G-E No. 5 Flashbulbs to light the scene. (See diagram.) I masked the No. 5 Flashbulb closest to the camera with a cloth. Exposure time was about 20 seconds. It's been my experience that G-E is the bulb you can count on to deliver the punch you need every time!"



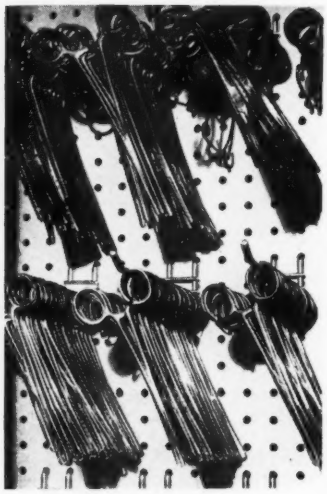

**GENERAL ELECTRIC PAYS $50.00** upon acceptance of photographs illustrating difficult lighting problems you've solved with General Electric Flashbulbs. Send your picture with a detailed description to: Photo Lamp Dept., General Electric Company, Nela Park, Cleveland 12, Ohio.

GENERAL ELECTRIC

Get more information. Circle 437, page 79

# A MAN AND A CAMERA TELL HOSPITAL TALE

**Johns Hopkins Hospital, a pioneer in medicine, has developed an effective new type of public relations program, using photographs to introduce the hospital and its people to the community they serve. The basic requirements—one man and one camera.**



*Tools of the trade*

"The hospital which does not use a camera to tell its story is passing up one of the best story-telling techniques in public relations, for wherever you point a camera in the hospital-medical field, you find an effective picture."

This is the conclusion of Richard C. Thompson, assistant director of public relations at Johns Hopkins Medical Institutions, the famed teaching-healing-research installation which has added so much to American medicine. After four years' experience, during which time he established and maintained a master photographic file, Thompson is convinced that hospitals are missing their best chance for meaningful public relations program by neglecting the use of photography which is unsurpassed for realism and immediacy.

*Statistician displays wares*

"There are few things closer to the interests of most people than health and hospitals, medicine and research, because these can be personalized by the reader and his family. By using pictures, you don't *tell* them what do, you *show* them. Our public relations program at Hopkins, directed by William A. Miller, is as active as the medical institutions themselves. We have made photography a working part of that program. Photography plays so big a part that our publications—annual reports, medical school catalogs, all types of booklets and brochures—are predicated on the availability of good photographs. With all the pictorial resources of a hospital —children, nurses, laboratories, surgeons, buildings and ambulances, clinics and patients—there is no need to produce banal pictures nor force an editor to use anything less than an interesting, arresting picture."

*Nutrition study: three little rabbits and how they eat*

The photographic activity in public relations began when the department received a request from the director of the hospital that they prepare an illustrated annual report to be given to interested persons. When the report was completed, the PR section had accumulated about 400 photographs of perhaps 100 various situations. The report used but 36 pictures.

*The surgeons fight for life*

◄ *Does it hurt here*

*A hospital always hears a cry for help*

leaving the rest as a nucleus for a permanent file. As other publishing projects have come along, the file has grown accordingly. For example, a recent booklet on "Student Nurse at Johns Hopkins" added 200 new photos to the file. These pictures are used not only in the project itself but in other feature stories. One of the projects, on an intern's first day at Johns Hopkins, appeared in the Sunday magazine of the Baltimore *Sun*.

"Selected pictures from 'An Intern's Day' were used in the hospital's annual report, with single pictures and scattered small sets going out to various journals and publications requesting them. The complete series is a file from which we will draw pictures for a forthcoming residency manual." This multiple use of pictures cuts the actual cost of photography.

*Radiologist using gloves X-rays infant*

Good photographs will be used indefinitely until they are out-of-date, but care is taken that there is no duplication to the same readers. "Two years ago," remarked Thompson, "I shot an open-heart operation at the hospital. It was a four-hour operation to repair a birth defect within the heart, requiring the use of a special heart-lung pump. Both the operation and the pump were new at the time. I shot three rolls, but one of the photos, showing the pump alongside the patient seems to summarize the whole operation. This picture has been used eleven times, in our first annual report, our nursing school catalog, a surgical textbook, a *Sunpapers*' medical feature, a heart association booklet, a government publication, an Associated Press article, the *Journal* of the College of Surgeons and, greatly enlarged, as a mural background for a network television program. It may very well be in the mail now, en route to a twelfth user." Other photos have done similar repeats.

*Staff conference in pediatric ward*

The picture file is kept up to date. Old pictures are taken out and placed in the Hopkins' archives while new pictures, taken by Thompson, are added to the file. Requests from most publications are honored, but the pictures may not be used commercially. It is this file which enable Johns Hopkins to meet requests for photographs quickly and definitively. The PR section feels that even if their pictures are not used in connection with Johns Hopkins, the fact that people come to accept them as a source of pictures is, in itself, a sufficient reward. It provides some assurance that the photographs will be used properly. (*continued on page* 83)

# REPRODUCTION & GRAPHIC ARTS

HERBERT P. PASCHEL

**Innovations cut offset platemaking time to near the minute mark**

Automation in small offset duplicator platemaking has finally appeared on the scene in the form of two fully integrated processing machines. In both cases all of the operations necessary to go from original copy to plate are performed by one piece of equipment under normal room illumination. The two machines were shown publicly for the first time at the 7th Educational Graphic Arts Exposition at the New York Coliseum the week of September 6th.

### Photoplax

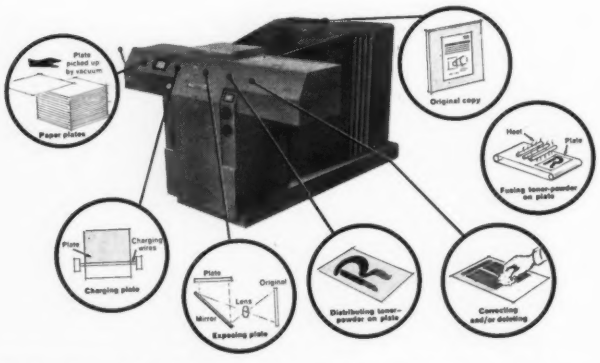
The Photoplax Camera Processor (A. B. Dick Co.) is a combination of a focusing camera and a developing unit. With the exception of inserting the copy to be photographed in the copyboard and placing a special aluminum offset plate on a feed tray, all other operations are performed by turning cranks and pushing buttons. Lensboard and copyboard are brought to their proper position manually with a calibrated scale showing focus. By turning a crank the desired length of negative paper is advanced from the magazine to the focal plane, another crank actuates a cut-off knife. During exposure the negative paper is held in position on a vacuum back. Following exposure and release of vacuum another crank operates a train of rollers which bring the exposed paper and the aluminum plate to the entrance slit of the developing unit. The two pass through a developing solution separately but in unison, and then enter a set of rollers which squeegee the plate and paper together in register. The laminate is then ejected from the machine. While in contact a direct-reading positive is being developed on the offset plate. After about 15 sec. of contact the negative paper is peeled from the plate which, following a minor surface treatment to strengthen the image, is then ready to put on the press. All of the operations described are completed in less than two minutes. Cost for materials is about 38¢ per finished plate based on minimum quantity purchase. The plate is rated to have a press life of at least 10,000 impressions.

The Photoplax system is based on the diffusion-transfer-reversal process which has been in use for some time in connection with simple reflex (contact) photocopying and in the Polaroid camera. The application to offset platemaking by contact (reflex) copying was reported in the December 1958 PMI. The Photoplax technique is essentially identical to the previously reported contact method except that the negative paper is camera speed. Commercially available models are scheduled for delivery early in 1960.

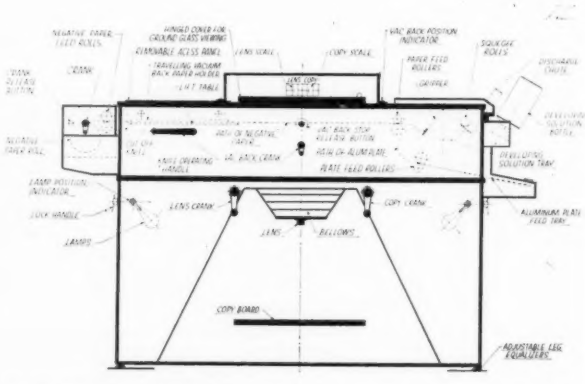
### Gevaert

Those who already own small copying cameras can set up a similar system, though less automated, by the mere purchase of a DTR processing unit. Camera-speed DTR negative paper was introduced in October by The Gevaert Co. of America, Inc., as a companion item to the Gevacopy contact-speed paper. The use of this paper in conventional cameras with, of course, the special aluminum plate, makes it possible to set up a fast, simple platemaking system at a minimum of additional expense.

In use, a sensitized paper negative is placed in any appropriate camera which will accept the 10 x 15-in. size —or under an enlarger loaded with a positive transparency or positive microfilm. The negative is of camera speed—about the same as most process films. Following exposure the negative is run through a special diffusion transfer reversal processor (*see illustration*) similar to those used in office copy machines in unison with an aluminum receiving plate. Because of the speed of the negative material, this procedure must be carried out under a red safelight. Once the image is transferred




**Robertson Electricon** is a complete, self-contained platemaking system that enlarges or reduces opaque original. Diagrams show works of electrostatic innards counter-clockwise.




**A. B. Dick Photoplax** also is complete, no-darkroom enlarging or reducing platemaker, arranged within vertical camera. It is based on less-than-2-min. DTR processing system.

to the aluminum receiving sheet, room lighting may be used. The entire processing cycle consumes less than two minutes. Following transfer a proprietary lacquer is used to strengthen the plate. It is then ready.

Gevaert officials indicate that press runs in the tens of thousands are regularly obtainable. The material cost of the completed 10 x 15 plate will be approximately 59¢. Resolution is high enough for the plate to adequately record a screened image. The cost of the processing equipment is approximately $100. Gevaert hints that larger plate sizes will be available in the near future.

### Ektalith

Mentioned in a previous column was the Kodak Ektalith process, which also provides offset plates quickly (less than 2 min.) and provides sufficient sensitivity for use with a camera or enlarger. It was made public at the National Business Show in October. Present equipment includes a daylight 9 x 14 loader-processor at $500, a paper-print transfer unit at $98.50, a 12 x 18 darkroom processor at $875.

### The Electricon

The second of the automated platemaking systems is based on a electrostatic (Xerography) rather than a photographic principle. The Robertson Electricon Camera, like the Photoplax machine, is a combined camera and platemaking unit.

The Electricon platemaking system differs from the well-known Haloid Xerox method in that no master electrostatic plate is used. Instead, the paper offset plate itself contains an electrostatic layer. Thus, an image is generated directly on the plate thereby eliminating the usual transfer operation. (The electrostatic offset plate is an offshoot of the Electrofax process developed by RCA under license from Haloid. (The Statimat offset duplicating master used in the Electricon camera is made by Plastic Coating Corp.).

After the original material—drawings, typed and printed matter, etc. —is placed in the copyboard of the camera section all subsequent steps are fully automatic. A vacuum pick-up transfers a coated paper master from the magazine to the focal plane of the camera. In the course of the transfer the plate passes across corona discharge wires which activate the plate by depositing a positive charge of electricity onto the special coating. After exposure the plate is automatically dusted (developed) with a negatively charged toner-powder. Prior to the final operation which makes the image permanent, the plate may be intercepted. At this point deletions may be made by simply wiping off the unwanted areas. In the final step the plate passes under heating grids which fuse the resinous image. The plate is then ready for immediate use. All of the steps following insertion of the copy material are completed in just one minute. The Electricon Camera is available in three sizes—8½ x 11, 11 x 17 and 17 x 22.

The Electricon Camera is a product of Robertson Photo-Mechanix, Inc., Chicago, Ill. The same firm designed and built the Photoplax Camera Processor for A. B. Dick Co.

The exposition was also the occasion for Minnesota Mining and Manufacturing Co. to introduce two new presensitized offset plates. The type "S" plate is an all aluminum, negative working, smooth, one-sided plate designed for applications where maximum image quality and press durability are required. The sensitive layer is inherently water resistant and requires no lacquer or rub up to strengthen the final image. Image resolution is claimed to be equal to deep etch and company reports of field tests suggest that press life approaches that of deep etch plates.

3M's other entry is the type "L" plate which is a smooth, two sided aluminum foil, negative working. A single solution developes, desensitizes and gums the plate in one simple rubbing operation. The type "L" plate is a low cost plate intended to compete with paper plates. In addition to economy, ease and speed in handling, the "L" plate offers the dimensional stability of metal and excellent reproduction quality.

While both products are "market ready," final prices and distribution dates have not been announced.

**Gevaert** DTR system operates with purchaser's own camera or enlarger.


# New Look Sinks

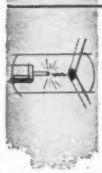
## with the features you asked for

**ROUNDED CORNERS**
Streamlined and safe.

**ADJUSTABLE FEET**
Each leg has a swivel ball-jointed leveling screw. Your LEEDAL sink will always drain completely.

**QUICKLY DIS-ASSEMBLED**
By removing a few bolts it goes thru door as narrow as 20".

**ONE-PIECE CONSTRUCTION**
Splashwall is integral part of the unit. No chance for leaks, no looseness, complete rigidity.



**HELI-ARC WELDED**
Heli-arc welding actually fuses the corners together into a continuous piece of metal. No leaks, no chance for corrosion or contamination.

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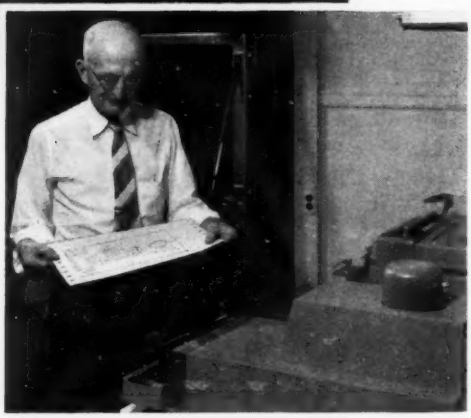
**NEW FROM KODAK...**

***... for all users of offset duplicators***

**Four ways to use new Kodak Ektalith Method**

**Sleight of hand in full roomlight.** Ingenious Ektalith Loader-Processor is used to load high-speed Ektalith Transfer Paper for exposure to camera . . . and to process exposed sheet. Attached Ektalith Transfer Unit lets you put image on paper plate in full roomlight. Complete installation costs less than $600 . . . teams up with almost any office camera.



**Good news for darkrooms.** Add a low-cost Kodak Ektalith Processor and Transfer Unit to your setup and you're all set to turn out camera-quality paper plates. Expose Ektalith Transfer Paper in process camera in usual manner. Complete job in Ektalith equipment under red safelight. Corrections can be made with eraser, additions readily made.

# masters made photographically with Kodak Ektalith Method!

***New low-cost Kodak Ektalith Method*** brings the speed, quality and flexibility of camera copying to "paper platemaking." Makes "short run" jobs easier, more economical—*and cuts capital investment*—for users of *all types* of popular office-size duplicators.

***Simple as A-B-C.*** Just three quick steps for a high-quality master (reduced, enlarged, same size) that will give you hundreds of sharp, clean copies of office forms, engineering drawings—all line and halftone material.

1. **Expose** high-speed Kodak Ektalith Transfer Paper using your present copy or process camera.
2. **Process** in ordinary roomlight with ingenious new Kodak Ektalith Loader-Processor. Or in darkroom with a Kodak Ektalith Processor.
3. **Transfer** to paper plate with Kodak Ektalith Transfer Unit in roomlight or darkroom.

*Total time*—from shooting the original subject to "on the duplicator"—just 2 minutes.

***Kodak Quality.*** Whether you're copying line work or halftones, the Ektalith method assures sharp reproduction of the minutest detail.

Solid blacks are reproduced alongside fine detail without mottling. Backgrounds remain clean—are even cleaned up, as in the case of worn, "yellowed" engineering drawings. Not to be overlooked either is the uniformity and wide latitude of high-speed Ektalith Transfer Paper which lets you handle those "101" different office jobs faster and at lower cost.

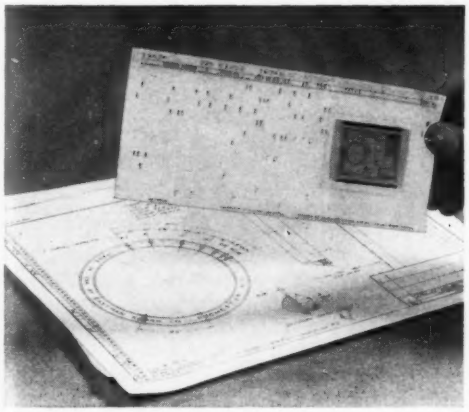
In short, the Ektalith Method is *another* important contribution by Eastman Kodak to the Graphic Arts Industry—well worth your immediate attention.

Phone your local Kodak Ektalith Dealer for further details, or write:

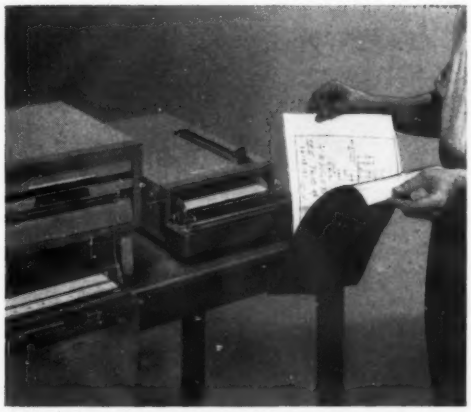
Eastman Kodak Company, Graphic Reproduction Division, Rochester 4, N. Y.

KODAK Ektalith METHOD

***... puts you ahead in offset***



**A "natural" for microfilm users.** Blowups of engineering drawings and other reduced data can be made on Ektalith Transfer Paper in standard enlargers from microfilm positives. Copies can be made directly from Transfer Paper in Kodak Ektalith Copy Unit. If more copies are called for, simply use Ektalith Transfer Unit to make plate.



**Big savings in systems work.** Need 10 to 20 sharp copies of office forms, orders, reports? No platemaking is required when you team up your copying camera with Ektalith Loader-Processor and Ektalith Copy Unit. Entire job can be done in full roomlight . . . copies made fast and conveniently.

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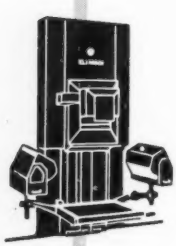

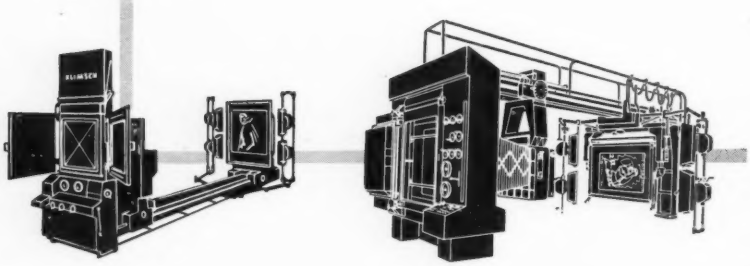

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## LETTERS

(*continued from page* 10)

To the Editor:

In your February 1959 issue on page 35 you published a formula for a monobath solution, containing a compound called Phenidone, which I have not been able to find listed in any of the chemical supply houses in Detroit.

[May I have] the name of the manufacturer and his address or any source of supply which you . . . might have?

Peter R. Rogan
Detroit, Mich.

*Phenidone is available from: Ilford, Inc., 37 W. 65th St., New York, N. Y., Heico, Inc., Stroudsburg, Pa. and Philip A. Hunt Co., Palisades Park, N. J. The Hunt trade name is Graphidone. Catalog price: $13.50 per pound.—Ed.*

To the Editor:

The article titled *Motion Measurement* by W. G. Hyzer is a very interesting and informative one.

I would like to obtain the name and address of the manufacturer of the film-motion analyzer that was illustrated and discussed in the article.

E. R. Heebner
Roy S. Sanford Co.
Oxford, Conn.

*. . . The film motion analyzer illustrated and described in the . . . article is manufactured by the Vanguard Instrument Corp., Valley Stream, N. Y. The instrument described is called a Vanguard Motion Analyzer, which is available in both 16 and 35mm film sizes. William G. Hyzer*

To the Editor:

We would like to take this opportunity to let you know what we think of . . . PMI.

We have been receiving this magazine since it was first published and find it a very fine magazine.

We think it is written with the professional in mind, and with reading its many articles we have found much information and helpful ideas. It is not cluttered up with worthless advertising as many of the photography magazines are. Your advertisers all have something to offer to the professional man and company. The reader service cards, we find, are very helpful in obtaining direct information from the manufacturer. We have used this service quite regularly and certainly do like the results. . .

Jim McCulloch
James Photography
Duluth, Minn.

*Roses are read.—Ed.*

## F.Y.I.

(*continued from page* 8)

pigeon, word of mouth or similar non-mechanical means. Our schedule is about two months ahead. In this case, the secretary we mentioned some lines back should have sent his notice to FYI around August 15, or September 1 at the latest. Remember . . . if in doubt, send it out.

All of which is an introduction to the earliest of early-bird items we've seen in a long time. First, there will be the 1st International Congress on Medical Photography in Cologne from September 27-30, 1960, in conjunction with Photokina. For detailed information write to:

Deutsche Gesellschaft fur Photographie eV., Neumarkt 49, Kohn, Germany.

Remember the date . . . 1960.

The Institute of Environmental Science, a newly-merged group of engineers and scientists in the aircraft and missile fields who are interested in the effects of environment on man and equipment, will hold its 1960 National Meeting in the Biltmore Hotel, Los Angeles, Calif., on April 6, 7, 8. The theme will be "Hyper-Environments – Space Frontier." Prospective speakers should contact Neal Grannick, 66 Waverly Ave., Dayton, Ohio. Manufacturers interested in presenting exhibits should see Bruno Forscher, 16446 Bircher Street, Granada Hills, Calif.

Congratulations, early birds. We hope that your events turn out successful in every respect.

### A miscellaneous miscellany

Do you have bunches of old X-ray film lying around that you don't know what to do with? Handy and Harman, 82 Fulton Street, New York 38, N.Y., will either buy it outright or refine it for you. Before sending your film down, write and tell them what you have and all that. And remember Benjamin Franklin . . . "a penny saved is a penny earned."

George W. Colburn Laboratory, Chicago, is joining with the Industrial Management Society to sponsor a contest for the best 16mm "Before and After" methods improvement motion picture. Winning contestants will receive awards at the IMS convention this month at Chicago. Colburn is supplying free titles to all contestants.

ColorTran informs us that the PAR 64 bulb has an average life of 40 hours at 3400K, compared with a 15-hour life of a 150-watt house bulb at the same rating. This is to correct a statement about the short life of regular bulbs which have their voltages boosted. They also tell us about a special 150-watt long life bulb which will last over 40 hours. We hope that the record is hereby set straight and that we are still friends.

A note to program chairmen: The White Sands Missile Range offers free films (16mm) on missiles, rockets and such. For information, write to the Commanding Officer, U.S. Army Signal Corps Support Agency, White Sands Missile Range, New Mexico. Attn: SIGWS-PI.

Final note department: The Fifth International Congress on High-Speed Photography, to be held in Washington, D.C., October 16-21, 1960, has the endorsement of the United States Senate. The affair will be sponsored by SMPTE.

### M. Louis-Philippe Clerc dies

Death took the world-reknown photographic scientist, Louis-Philippe Clerc, September 7, 1959. Monsieur Clerc's career in photography extended from the turn of the century until his death at the age of 84. In his early 20's he became an instructor in analytic chemistry at the University of Paris. Shortly afterward he founded a school for technical photography and cinematography in Paris. He taught photographic photometry at the Paris Institute of Physics. During World War I. Monsieur Clerc's work in aerial photography won him the Croix de Guerre; in 1949 he was made a Chevalier of the Legion of Honor in recognition of his contribution to society.

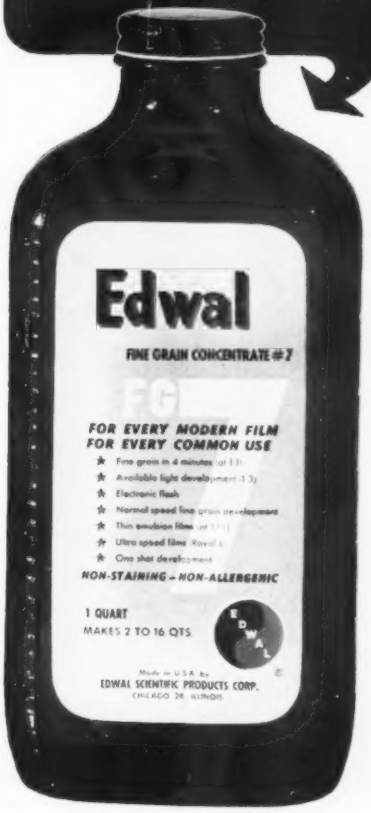
Best known for his writing on the technical aspects of photography, he was the editor of *Science et Industries Photographiques* and author of more than 20 books on photography, treasured in the personal libraries of photographers and photoscientists the world over.

### Errata

Bad proofreading of L. E. Varden's "Tone Reproduction" in the October issue of PMI left some readers in the lurch. On page 45 a new illustration intended to show the difficulty encountered in making monochrome copies of colored objects was substituted for the author's sketch but the corresponding text was unaltered. Other mistakes should be revised as follows: page 41, diagram, parallel dotted lines are approximately ⅛ in. too distant from one other; page 45, second line, in for is; page 87, sixth line, one for on; subheading, subjective for subject.

As a reminder—send in your news—but send it as early as possible.


Today's Developer for Today's Films

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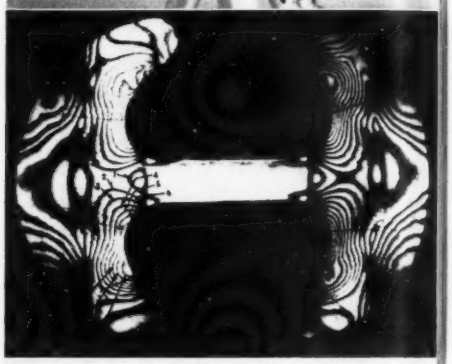
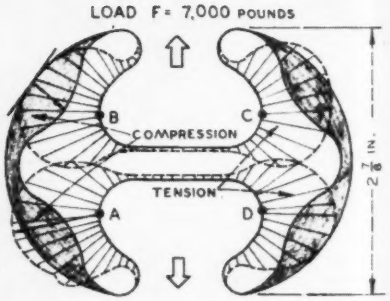
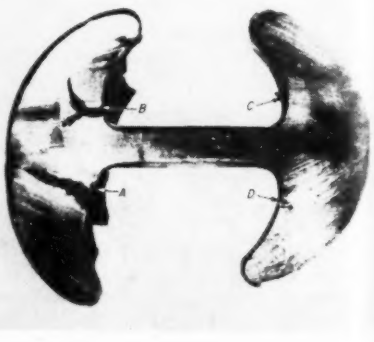
*A recent and unique photo instrument permits recording stresses on the surface of actual parts. PMI telephoned America's leading expert on the subject, tape recorded this interview with Budd Company's Tatnall Measuring Systems PhotoStress Production Manager* ***Dr. Felix Zandman***

# PHOTOSTRESS ANALYSIS






**Q. Dr. Zandman, can you give me a little history of the work you are doing?**

**A.** What we are doing here is developing and perfecting a method of stress analysis. The name of the method is PhotoStress. It consists of measuring stress and strains on the surface of actual parts loaded in an actual way. The part is coated with a special plastic, clear plastic, which changes its optical characteristics when stress is applied. These optical changes, a function of stress, appear as color and black fringes when polarized light is used to observe the plastic. The technique of observing stains in transparent material using polarized light has been known since about 1816. However, in the past, models were required.

The principles of making these measurements directly on metal originated in France 30 years ago. PhotoStress was put into useful shape six years ago in France. The materials have been marketed in Europe for four years, and in the States since 1957.

**Q. How does photography enter into this?**

**A.** As the name indicates, the part of photography is important. Photography is our recorder and our measuring device at the same time. Photographs can be included in reports as permanent data sheets. PhotoStress photographs are made in black-and-white or in color. We have also been using television in black-and-white or in color and then photographing the screen. So it's very flexible. Whatever can be used in conjunction with photo cells, observation, photography, television is applicable to this technique.

**Q. Could you explain the difference between stress and strain?**

**A.** If you apply a load to a part, the part is stressed; the molecules inside the part must counteract the external load to maintain equilibrium. Action is equal to reaction. If the action is load, the reaction is something similar to load, it is called stress: the load per unit section. For example, if you apply a 1000-lb. tensile load to a specimen with a section of 1 sq. in. its stress will be 1000 divided by 1 sq. in. That is 1000 psi.

Now the strain is the elongation of the part. If you put a 1000-lb. load, for example, on a part made of steel, it will elongate a bit. Correct? Now, if you take a 1000-lb. load and you apply it to the same shape of the specimen, but made of rubber, it will elongate a lot. So the stress will be the same in both parts, for the load applied, however the strain will be different.

**Q. Could you explain briefly why your transparent material changes with the stress?**

**A.** This is quite a complicated question. Let's put it this way: you

**Camera, light source, polarizer are tools for PhotoStress**

Shown at left is a typical set-up for recording stress patterns with the PhotoStress system. The light source is a commercial slide projector. Any camera can be used. The double polarizer is a Large Field PhotoStress Instrument. They face the sample under study. The stress pattern can be observed visually from camera position. Very high speed motion picture work may demand greater light in the form of low-voltage lamps, arc lamps or flash devices in place of projector. With large subjects illuminated by sunlight, a polarizing sheet is spread on sample.

**Zebra stripes lead to direct measurement of the stresses**

To make PhotoStress study, a sheet of a special clear plastic is bonded to the metal under study. When stresssed and viewed with the equipment shown above, a pattern such as that at left appears. The stripes connect areas of equal stress. Their colors can be read off in lbs/sq. in. of stress.

**Photo is a graph of direction, sign and degree of stress**

The diagram at left, made from data derived from the PhotoStress photograph illustrates some of the information obtained from the system. It also shows the forces used to bring about tension and compression on the part. A,B,C and D are points where photo indicated breaks may occur.

**Snap, crackle and pop: destructive test proves pudding**

The photograph at left, made with non-polarized light, indicates the accuracy of the PhotoStress analysis. When the load on the sample was increased until it snapped, ruptures were at points A,B,C and D as indicated by the PhotoStress study which is shown in previous pictures.

take a piece of glass which is homogenous and isotropic. That is, it has the same physical properties in all directions. If you apply a load to it the mechanical properties of the specimen will change in every direction. We call it an unisotropic condition. Using polarized light—meaning light vibrating in one plane—which is also unisotropic in nature, it is possible to create an interference pattern. The same is true of PhotoStress plastics and some other plastics. This interference pattern shows up as color fringes. They vary as a function of stress, and using some formulas, we go from them to the amount, sign and direction of stress.

**Q. You said that using transparent models made of some plastics or any glass, the same information could be observed and photographed as with your PhotoStress.**

A. Yes. Observed, measured and photographed. But this will give you the stress distribution in the model. And then you have to make the assumption that the model is working in the same condition as the part, the real part. In the case of PhotoStress, a thin layer of plastic is bonded to the true part. Therefore, not only is it unnecessary to make a model, but is unnecessary to make these assumptions. The color pattern seen by polarized light is very similar in either case. You understand?

**Q. I understand. However, I should think there would still be some type of correlation necessary—you are not looking at a specimen but rather at a piece of plastic material on the specimen.**

A. That's right. But you see the PhotoStress plastic is bonded to the sample. It behaves strain-wise like the sample.

**Q. I wonder if you could tick off a few of the applications of PhotoStress. . . .**

A. Aircraft. Especially aircraft because they are highly-stressed structures. The aircraft industry is our biggest customer. Another class of purchasers includes guided missiles people and armament people—with the same type of problems. The automobile industry uses PhotoStress analysis on rims, on brakes . . . on all types of parts that are subjected to stresses. Using PhotoStress you can detect the area of danger and what has caused the danger, also what type of loading is dangerous for a structure.

In previous methods used, you could get a value at a point. You were saying, "well at this corner I suppose the stresses were at the maximum." So you attached an instrument at this point and measured. You were guessing on this. In our case we bond the plastic all over the part, and wherever we have color concentrations, we know we have stress concentrations, points of possible rupture. PhotoStress is a continuous survey of the stress behavior in a structure.

**Q. What does Tatnall supply for PhotoStress analysis?**

A. We supply the plastics, instruments to observe the color pattern and to measure the amount of stress in psi—and we supply services. In case somebody does not want to buy equipment, we will send an engineer to work with the customer and give him a report on the stress behavior of his part. We also supply instructions. When somebody buys equipment, he is entitled to one or two days' full instruction on the use of it.

**Q. How would you describe the photographic set-up in PhotoStress analysis?**

A. The set-up would be, use one of our instruments, but instead of looking through the instrument and seeing the fringes, you put a camera in place of the eye. That's all.

**Q. Let's see now, the axis of the camera lens is normal . . .**

A. To the part, eh, approximately normal, not essential.

**Q. And where is the axis of the light?**

A. The light is also approximately normal to the part. So you have side by side the light source and a Tatnall instrument. Behind the instrument is the camera. The light goes toward the part, goes into the plastic, is reflected from the surface of the part and goes back through the plastic through the instrument and to the camera. All right?

**Q. How critical is exposure?**

A. You can miss the correct exposure by one or two stops with color film and the photograph still can be used.

For quantitative purposes in photography we cover a cantilever beam with plastic and we load it. Then we have all types of colors on the cantilever. We photograph this together with the part. So if we

*(continued on page 70)*

# You can still make it!

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PMI—Photo Methods For Industry

*Preferred Magazine of the Photo Engineer*

# HIGH SPEED CAMERA:

The nomograph (*right*), applicable to Magnifax, Fastax and Fairchild 16mm high speed motion picture cameras, of both 100-ft. and 400-ft. capacities, provides a handy reference for estimating the total running time and the effective starting time of the above cameras for a given mean picture frequency. Conversely, the operating picture frequency of a camera can be determined by measuring the time required for a standard length of film to run through the camera. An indispensable accessory for this determination is an accurate stop watch. The running speed of most rotating prism cameras is determined primarily by the applied camera voltage, but this is modified significantly by frictional variations occurring within the camera and undetermined voltage drops in the power line. On critical set-ups, especially where adverse ambient temperature conditions prevail or where long extension cords are required, the camera running speed cannot be predicted accurately from curves supplied by the manufacturer. In these cases it is advisable to run a test film through the camera and measure the total running time with a stop watch. Knowing this duration, means picture frequency can be accurately estimated from the nomograph.

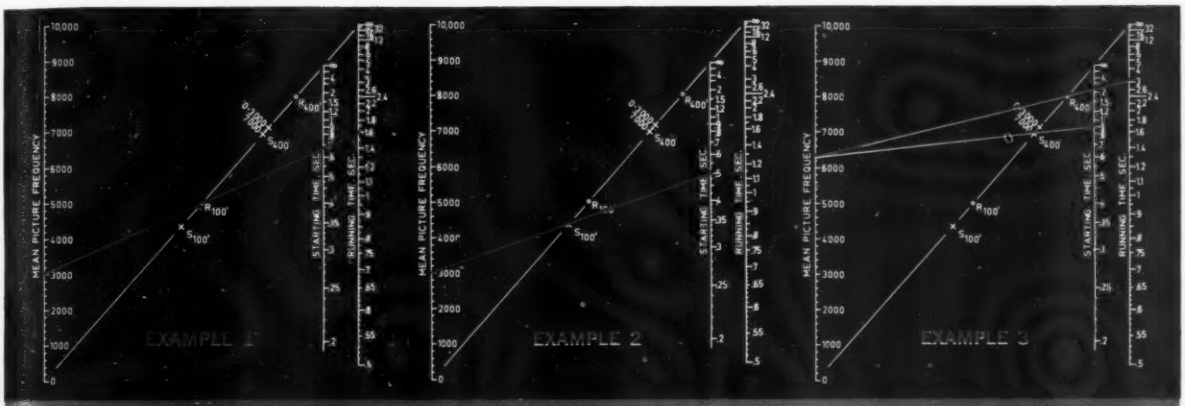
Mean picture frequency is defined as the instantaneous frame repetition rate (in frames per second) at the midpoint of usable film; which corresponds to the 60-ft. mark for 100-ft. film rolls and the 210-ft. mark for 400-ft. rolls of 16mm film. Nomenclature used on the chart is as follows: $^{S}100'$ = starting time for 100-ft. rolls • $^{R}100'$ = running time for 100-ft. rolls • $^{S}400'$ = starting time for 400-ft. rolls • $^{R}400'$ = running time for 400-ft. rolls.

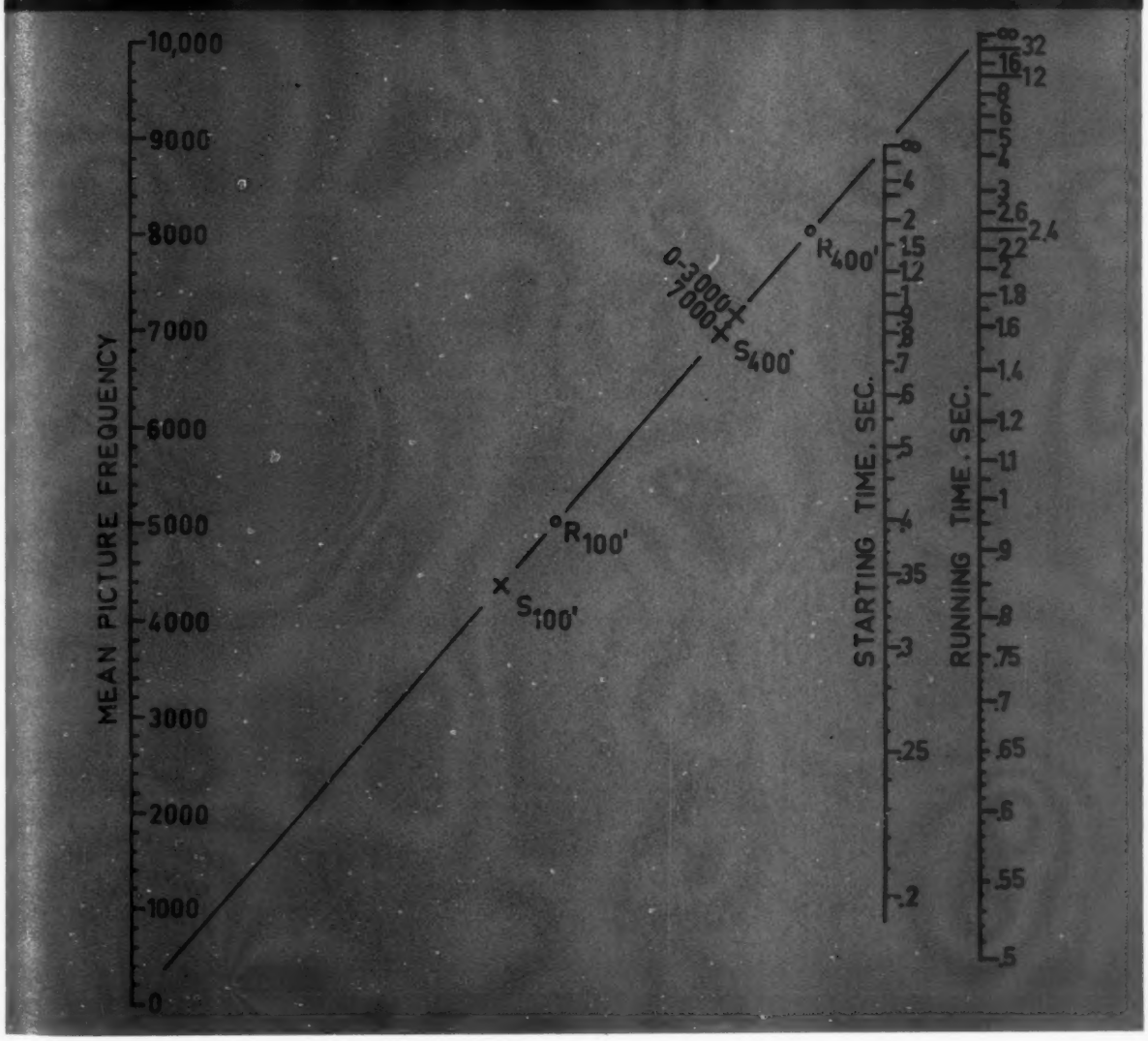
Problems involving starting time for 400-ft. capacity cameras involve more than one point for $^{S}400$ depending on the mean picture frequency. 0-3000 mpf use point indicated. For all other mpf higher than 3000 up to 7000 use intermediate points along the diagonal line as indicated.

(*continued on page* 71)

by William G. Hyzer

# NOMOGRAPH



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## PHOTOSTRESS

(*continued from page 67*)

have some color changes due to over exposure, let's say, both the calibration bar and the part will have the same changes. Since we are able to determine stress at every point on the calibration bar beforehand, we can therefore match color for color and determine stress in the sample in psi.

**Q. Can you give me an idea of the absorption of light in the system?**

**A.** Yes. The absorption of one polarizer is about 70 per cent. And since we use two polarizers—one on the light source and one on the light reflected from the subject—there is usually an additional loss of about 10 per cent. So you get only about 20 per cent of the light available. Now if the light is reflected from a diffusing surface—aluminum paint, let's say—you may ultimately get only 5 per cent of the original light coming back to the camera.

In a normal scene about 18 to 20 per cent of the light is reflected to the camera. From this we lose three-quarters, so about 5 per cent is left.

**Q. Are there any special considerations in the preparation of a sample when photography is going to be involved?**

**A.** It has been found that the best way to prepare a sample from the technical point of view—and at the same time from the photography point of view—is to have a nicely diffusing surface, not a shiny mirror. So what we do is to bond the transparent plastic with our reflective type cement. It is a cement which includes aluminum powder. This gives the sample under study a nicely even diffusing surface. Also, if you want to reduce glare, sometimes a dulling spray on the top of the plastic may help.

**Q. How about cutting other light falling upon the subject?**

**A.** Let's put it this way, the ratio between polarized light and unpolarized light shining on the part should be high. But you don't have to shut off the room lights to make pictures, the same applies to outdoor photography.

**Q. What kind of illumination is used for motion pictures?**

**A.** Photofloods are adequate for most motion pictures up to 1000 frames per second or so. Carbon arcs are also used. With black-and-white film a red filter is usually used over the light to produce monochromatic fringes.

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The Marine Corps recently made a high-speed camera recording which is 500,000 frames per second of the stress patterns involved in the penetration of a bullet in armor plate—and they are now preparing a test for 1 and 1½ million frames per second.

**Q. I wonder if you could tell me the light source in this case?**

A. Yes, ha, argon bomb.

**Q. Pardon?**

A. Argon bomb. When you explode a bomb in argon atmosphere it gives a tremendous light of a very short duration—say 10 microseconds and during this 10 microseconds you make the whole high-speed film. But you'll have to ask the Marine Corps for more information. They developed the system.

**Q. Where can a person get more information on PhotoStress?**

A. Where? He can get it from us, Tatnall Measuring Systems, The Budd Company, Philadelphia 32, Pa.

—THE END

## HIGH SPEED NOMOGRAPH

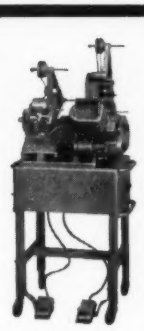
(*continued from page 68*)

Use of the nomograph is best illustrated by the following examples:

**Example 1:** To determine running time for a 100-ft. capacity camera operated at 3000 frames per second, extend a straight line between 3000 fps and $^{R}100'$ to obtain 1.6 sec. on the Running Time scale.

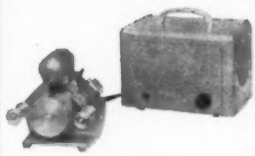
**Example 2:** To determine starting time for a 100-ft. capacity at 3000 frames per second, draw a straight line between 3000 fps and $^{S}100'$ to obtain 0.5 sec. Under the above conditions, initiation of the event should be delayed 0.5 sec. after starting the camera and should not exceed $1.2 - 0.5 = 0.7$ sec. duration or the film will be expended before the action is terminated.

**Example 3:** A 400-ft. test film requires 3 sec. to run through the camera. First, a straight line is drawn between 3 sec. on the Running Time scale and $^{R}400'$. The extension of this line crosses the mean picture frequency scale at 6300 frames per second. Starting time under the above conditions is obtained by extending a straight line from 6300 fps on the mean picture frequency scale through the 6300 fps division at $^{S}400'$ to obtain 0.9 sec. on the starting time scale.—THE END

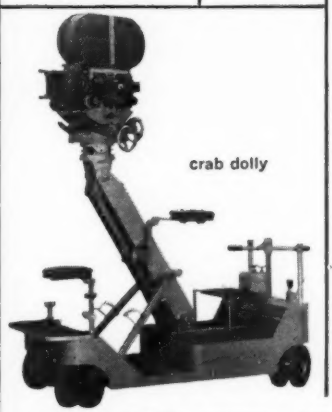


picture and sound editors

rewinders

video tape


sound readers

synchronizers


crab dolly

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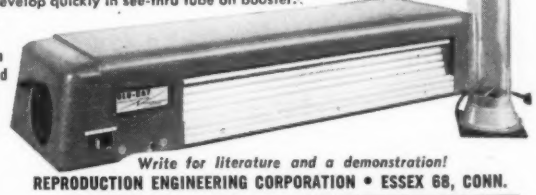

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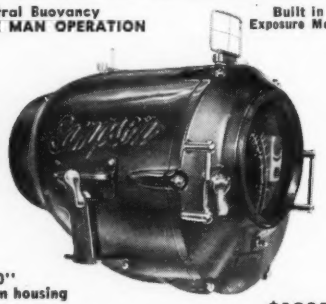

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**by Ernest E. Reshovsky**

# PHOTO INSTRUMENTATION

### 1200 lenses, the faster to see you with, in new Czech camera

News on photo instrumentation from Eastern Europe is relatively scarce so that almost any item would have a fair amount of news value. But a camera with 1200 lenses would make us sit up and take notice, even if it came from Rochester.

These lenses are mounted in a Czech VFK UVOJM High-Speed Camera which operates at speeds between 6000 and 42,000 fps. The camera is a drum type, specifically designed for good resolving power to get a good enlargement from a single frame rather than for live projection. The 1200 lenses are mounted in banks of four around the rim of the drum. Another drum holds an 1850mm (73-in.) length of film, unperforated 35mm. Image size is 5 x 8mm (1/5 x 1/3 in.) with four rows of images being contained within the width of the filmstrip. Each row has 326 exposures, giving a total of 1304 frames per run.

A resolving power of 80 lines per mm is claimed for the negatives. Effective aperture of the lens system is f/7, with the main objective having a focal length of 210mm.

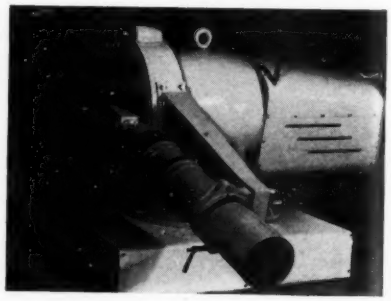
In operation, the image enters a mirror reflex chamber in the inner drum through a lens barrel and is deflected radially outward into a collimating lens system located near the small objective lenses mounted on the rotating drum.

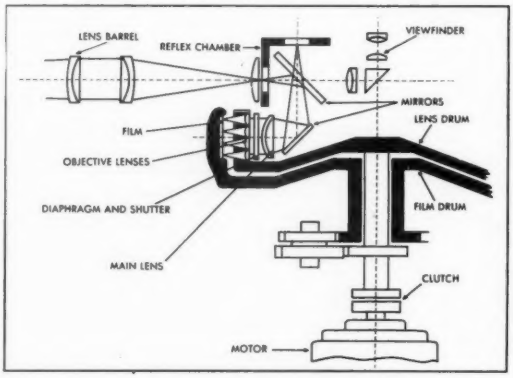
The drum carrying the lenses moves at a slightly faster rate than the outer drum which carries the film so that the linear velocity of film drum and lens drum are equal. This results in optical compensation and sharp exposures at relatively high operating speeds.

The exposure varies from .2 to .031 sec. per run, depending on the operating speed of the camera. Individual frames are exposed by means of an independent electromagnetic shutter which is mounted just ahead of the small objective lenses. This shutter can be actuated either from its own electronic control unit or triggered by various remote controls activated by the particular event under study.

The need for an elevated platform to bring instrumentation equipment

(*continued on page* 74)






New Czech camera with 1200 lenses operates at speeds between 6000 and 42,000 fps. Cross-section diagram shows how mirror system directs image to drums holding film and lenses. Pictures are recorded on four strips of film, side by side, on one 73-in. roll of unperforated 35mm film. Main objective has a focal length of 210mm.

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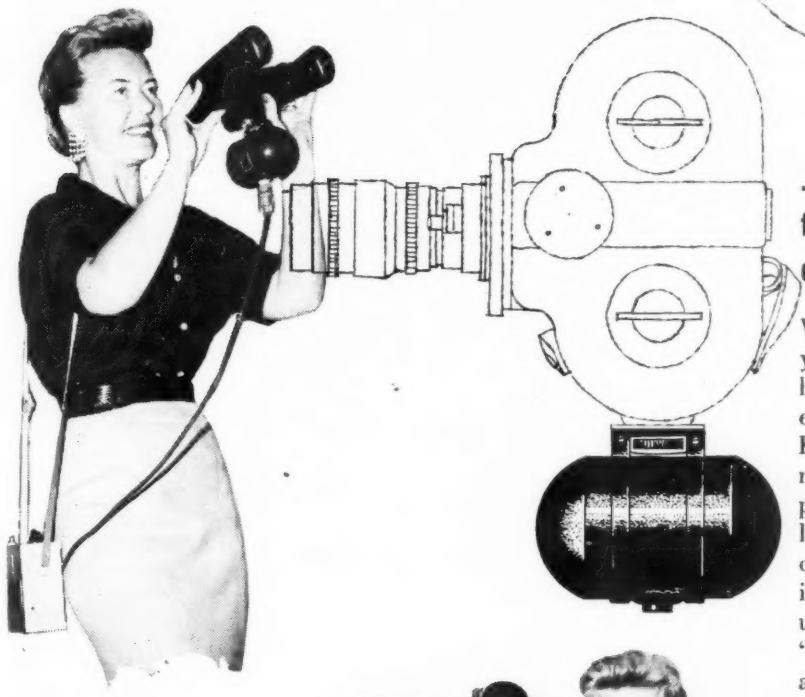

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The KENYON STABILIZER controls undesired motion by providing firm resistance to movement through a unique application of gyroscopic principles. Weighing only 28 ounces, the stabilizer is easily attached to a great variety of hand-held optical instruments. Truly portable, it is available with a light weight nickle-cad battery pack. A 115 volt converter is also available.

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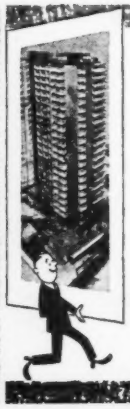

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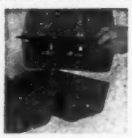

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## INSTRUMENTATION

(*continued from page* 72)

above the earth's atmosphere is a frequent topic at symposia of the Society of Photographic Instrumentation Engineers *(see PMI, Sept. 1959)*. Project Stratoscope I of the Navy does just that, using plastic balloons to lift telescope cameras to an altitude of 80,000 ft., above approximately 96 per cent of the earth's atmosphere.

The cameras, specially designed for solar use by Perkin-Elmer Corp., have a 12-in. aperture system with an effective focal length of 2400 in. and an f/8 paraboloid quartz primary mirror. The surface of this mirror does not vary by more than a millionth of an inch from a parabolic curve.

Information to be gained from the balloon-borne instruments is obtained with a special 35mm camera incorporated into the telescope design. The frame size, 1 x 1½ in., includes an area approximately equal to 1/2 per cent of the sun's surface area or about 50,000 x 75,000 miles. Exposure time is 1/1000 sec. and the camera carries film for 8000 exposures.

Aiming the telescope can be done by ground control through the use of photo-diodes. Signals from the diodes are amplified and used to drive motors which can adjust the azimuth and elevation of the telescope.

To overcome the environmental extremes under which the instruments operate (air temperature of about minus 60° C and the heat from the sun's radiation) special features were incorporated into the design.

The telescope tube between the primary and secondary mirrors is made of *Invar*, a thermally stable structural material. The tube is also perforated with about 40,000 holes which reduce the weight and minimize air convection.

The thermal conductivity of the mirror has been reduced to a negligible factor by using a micarta tubing, ¼-in. thick wall and ¾-in. diameter with nylon buttons for support which have small areas of contact with the mirror. The primary mirror cell is lined with a heavy layer of foamed plastic to give thermal insulation and serve as a shock absorber if mirror supports break upon landing.

The whole rig is carried by a plastic balloon with a diameter of 139 ft. and a length of 200 ft. Capacity of the balloon is a million cubic feet. Payload is approximately 1700 lbs. and can be lowered to earth in 25 minutes.—THE END

# FREE LITERATURE

**For your copy of any free literature item, circle the appropriate number on the reader's service card, attached, page 79.**

## AUDIO-VISUAL

**Rear View Projector** **200**
Staples-Hoffman, Inc. Illustrated specification sheet for the model NP-34 rear view projector for 2 x 2 slide presentations.

**Sound-Slide Projector** **202**
Amplifier Corp. of America. Illustrated price list gives specifications of the Magnematic sound-slide projector for 2 x 2 slides.

**Stop-Motion Projector** **203**
Birns & Sawyer Cine Equipment. 4-page illustrated brochure describes the 35mm stop-motion projector.

**Victor Magnesound** **204**
Victor Animatograph Corp. 4-page brochure describes the Magnesound recording-playback attachment for Victor 16mm sound projectors.

**Light Control** **201**
Hunter Douglas Aluminum Div. of Bridgeport Brass Co. Illustrated brochure describes the Flexalum audio-visual blinds for light control in classrooms and other temporary projection rooms.

## CAMERA & LENS

**Astro Lenses** **205**
Ercona Camera Corp. Illustrated brochure describes the Astro long distance lenses for still and motion picture photography. Prices and technical data included.

**Lens Conversion Adapters** **207**
Century Precision Photographic Equipment. Price list for machined adapters which allow interchangeable use of lenses for two or more cameras. Available for many popular 35 and 16mm cameras.

**70mm Studio Camera** **206**
Canadian Applied Research Ltd. Specification sheet for the 70mm twin-lens reflex studio camera.

**K&E Catalog** **208**
Keuffel & Esser Co. 26-page illustrated catalog, *Optical Tooling and Industrial Alignment Equipment*, includes specifications and technical descriptions.

**Filter Booklet** **209**
Tiffen Optical Co. 24-page booklet contains data of Tiffen filters for color and black-and-white photography.

**Vought Cameras** **210**
Vought Co. 4-page illustrated folder lists pulse and high-speed data recorders, film or record viewer and aerial spectroscopic 70mm camera.

## EQUIPMENT

**Color-Sep Unit** **211**
Paul Anderson Mfg. Co. Specification sheet for the Anderson Graphic Arts Color-Sep Unit for producing process color separation negatives and positives.

(*continued on page 76*)


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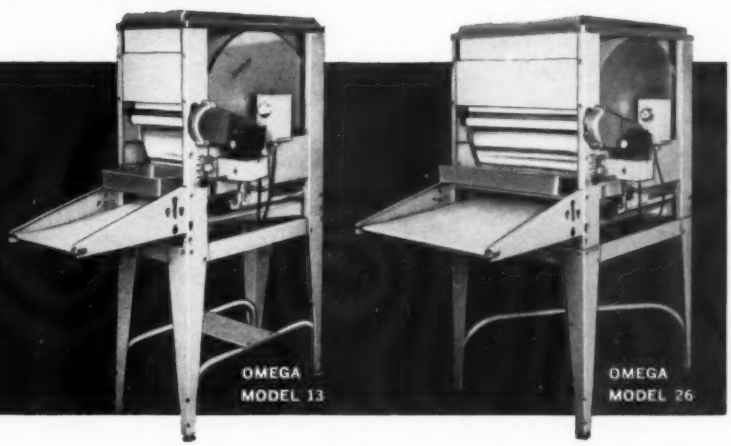


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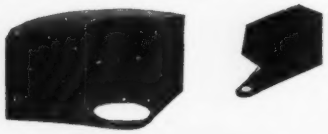

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**Studio Strobe** 212
Scheibe Engineering, Inc. 4-page price list for the Golden Starliter line of studio strobe units.

**Plan Files** 213
Plan Hold Corp. 8-page catalog of vertical filing equipment for plans, maps, engineering drawings and other large sheet materials.

**Processing Equipment** 214
Carr Corp. 20-page catalog of stainless steel processing tanks, sinks and accessories for black-and-white and color processing.

**Saltzman Color Enlarger** 215
J. G. Saltzman, Inc. 4-page brochure gives specifications for the Caesar-Saltzman enlargers with condenser or diffused light source for color work. Illustrations included of available accessories.

## GRAPHIC ARTS

**Etching Trays** 216
Henry P. Korn Associated, Inc. Price sheet for Plexiglas etching trays.

**Platemaking Equipment** 217
Process Camera & Equipment, Inc. 4-page illustrated folder includes the Clydesdale darkroom cameras, layout tables and vacuum printing frames.

**Acetate Overlay Sheets** 218
Para-Tone, Inc. 40-page catalog of Zip-A-Tone, Blu-Zip, Para-Tipe and other Para-Tone products consisting of acetate overlay sheets, type, symbols and friskets.

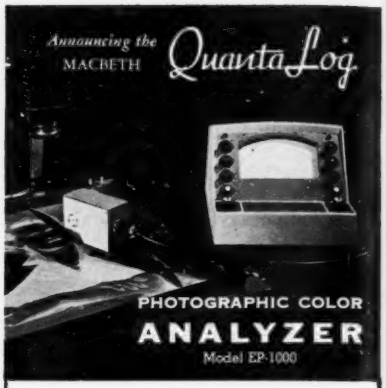
**14 x 20 Offset Press** 219
Banthin Engineering Co. 4-page descriptive brochure gives the specifications of the Lithomatic 14 x 20 offset press capable of 1000-5000 impressions per hour.

**Photocopy Booklet** 220
F. G. Ludwig, Inc. 14-page booklet lists 115 ways a photocopy machine may be utilized.

## MOTION PICTURES

**Foreign Language Dubbing** 221
Capital Film Laboratories, Inc. 5-page reprint from the *SMPTE Journal* includes a description of methods and new equipment necessary to convert a normal studio recording system for foreign-language dubbing.

(*continued on page* 78)

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Get more information. Circle 466, page 79

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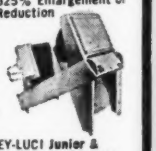

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"Professional, Industrial, Commercial Sales"

**Differential Rewind** 222
S.O.S. Cinema Supply Corp. Illustrated price sheet describes the Differential Rewind Gimmick for rewinding 16 and 35mm reels simultaneously.

**Kodak Pamphlet** 223
Eastman Kodak Co. 12-page pamphlet on the handling, repair and storage of 16mm films.

**Film Inspection** 224
Paulmar Inc. 4-page illustrated brochure describes the Paulmar 60 automatic film inspection unit for 16mm sound or silent film.

**Mood Music Catalog** 225
Thomas J. Valentino, Inc. 28-page catalog of mood music includes scintillating description of each composition.

**Music List** 226
Audio Master Corp. Brochure of selected listings of mood and bridge music for motion pictures and sound slidefilms.

**Comprehensive Catalog** 238
Comprehensive Service Corp. 38-page catalog of motion picture equipment.

## SERVICES

**Color Booklet** 227
Meisel Photochrome Corp. 24-page booklet gives exposure and handling suggestions for color films.

**Animation and Art Service** 229
Videart Inc. Brochure lists special effects, animation camera photography and art services offered by this New York outfit. Includes a footage conversion chart for 16 and 35mm film.

**Movie Lab** 230
Hollywood Film Enterprises, Inc. 8-page price list of 16 and 35mm motion picture processing and special services offered by this California firm.

## SUPPLIES

**Aerosal Sprays** 231
Anchor Chemical Corp. Illustrated brochure includes aerosol products for photography or printing departments: static eliminator, film cleaner, adhesive spray, etc.

**Gevaert Movie Films** 232
Gevaert Co. of America, Inc. Technical folder presents characteristics of professional cine films which Gevaert markets here.

**Lens Gauze** 233
Bebell & Bebell Color Laboratories. Price sheet for 7 x 11-in. lens gauze and sample.

**Intermediate Film** 234
Eugene Dietzgen Co. Specification sheet for the Perma Scale intermediate film on a Mylar base for making duplicate originals of engineering drawings.

**FilMagic Silicones** 235
The Distributor's Group, Inc. Price list for FilMagic cloth and tape for cleaning of films, records and lenses.

**X-ray Chemicals** 236
Philip A. Hunt Co. 4-page brochure gives data on Hunt's concentrated liquid X-ray developer, replenisher.

**1.75 Sec. Flash Lamp** 237
Fairchild Camera and Instrument Corp. 4-page photo instrumentation bulletin describes one use of the Sylvania long duration flood flash lamps in high-speed photography.

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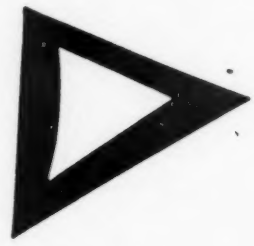

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# NEW PRODUCTS

**For additional information on any new product circle the appropriate number on the readers service card, page 79.**

### Flash Lamp Pulser 102

**A light source for multiple flash strobe pictures with a maximum flash repetition** rate of 10,000 flashes per sec. has been announced by Shapiro & Edwards. The flash duration is approximately 1 microsecond. A completely housed lamp with a 15-ft. connecting cable is furnished with the pulser. Power required is 115-volt, 60-cycle. Control is provided to allow either a converging or diverging beam to be obtained. The brightest flashes available have a total luminous output of about 150 lumen seconds.

### Time-O-Lite Mixing Valve 103

**Set for either 68° or 75°F the Time-O-Lite mixing valve is factory regulated.** The unit is said to maintain temperature within a tolerance of plus or minus ½°F as long as the cold water remains below the set temperature and the hot water remains above. Installation requires a connection to hot water pipe to one side and cold water to the other.

### New Graflex Items 104

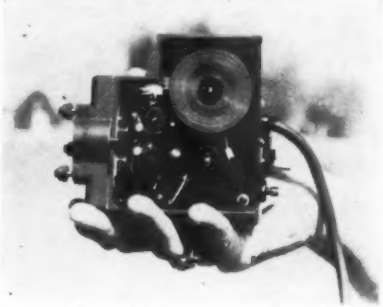
**Two new 35mm cameras and a new Super Speed Graphic with a 1/1000** sec. between-the-lens shutter has recently been announced by Graflex. The Century 35NE camera is a 35mm camera featuring a built-in coupled exposure meter. It has an f/2 six-element Prominar Lens and shutter speeds from 1 to 1/500 sec.

The Graphic 35 Electric, a 35mm camera with self-contained electric motor, winds the film, cocks the shutter and allows sequence or single exposures as desired. The camera will be available with four interchangeable lenses from 35 to 135mm. Price: with 50mm f/1.9 Iloca Quinon lens, $275, equipped with 50mm f/2.8 lens, $237.50.

The Graflex 1000 shutter specifically designed for the new Super Speed Graphic 4 x 5 camera is a between the lens shutter which is claimed to have exceptionally high efficiency. This is said to provide better motion stopping ability than with conventional shutters at comparable speed settings. In addition to the fast shutter speed the shutter features a built-in lens hood which also serves as the cocking mechanism. To cock the shutter the lens hood is turned approximately ¾ of a turn until it stops. Speed settings are visible on top of the lens mount with aperture settings. The speed changes may be made either with the shutter cocked or uncocked.

### Miniature 16mm Camera 105

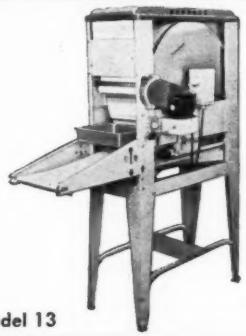
**A new 16mm motion picture camera designated the Traid 15 measuring only** 5 5/16 x 2 15/16 x 4 7/16 and weighing only 2¾ lbs. has been announced by the Traid Corp. It is equipped with



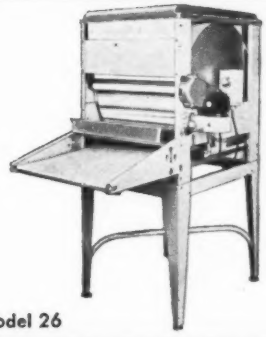
a variable shutter, magazine heater, 28V DC motor, adapted for interchangeable pre-loaded 50-ft. magazines

(*continued on page* 82)


**TWO NEW PAKONOMY DRYERS... for B/W Glossy and Matte Prints**



Model 13



Model 26

Here are two Models of the new Pakonomy Dryer that will solve the problem of handling large volumes of B/W glossy and matte prints and deliver quality results. All the latest features are included, plus modern, functional design. There is a new Pakonomy Dryer Model to fit your print drying needs.

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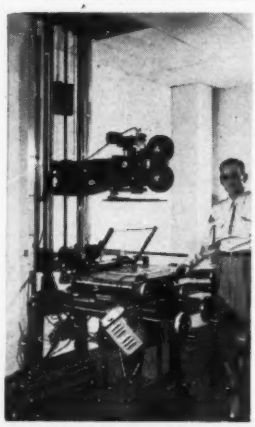

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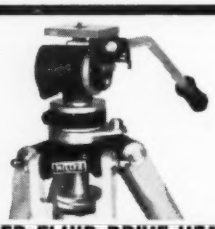

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and GSAP or "C" lens mounts. The camera can be obtained with any single speed of 16, 64 or 100 fps and has double tooth sprockets for high "G" loading.

**Kalart/Victor Projector 107**

**A 16mm sound projector with 15-watt amplifier is the Model 70-15 recently** introduced by Victor Animatograph Corp. Redesigned mechanical components are said to result in a reduction of motor gear and air noises. The need for day-to-day maintenance has been eliminated by means of an oil reservoir which provides for a full year's lubrication according to Victor. The 8-in. speaker is an integral part of the projector door and operates on the projector or may be detached and placed up to 50 ft. away. A new shutter design is said to increase total light output 12 per cent and provide still picture output 500 per cent brighter than in previous models.

**3000 Speed Polaroid 114**

**Fifteen times faster than Polaroid's Polapan 200 Picture Roll is Polaroid's** high-speed film with an e.i. of 3000. The photographic quality of the new film is said to be about the same as that for the 200 speed film. The new film is panchromatic and is being manufactured in two sizes: Type 47 for the larger model Land cameras and Type 37 for the Highlander model. Price for Type 47: $2.29 per 8-exposure roll; $1.79 for Type 37.

**Miller-Trojan Camera 120**

**A larger version of the Sharpshooter camera has been announced by the** Miller-Trojan Co. It will accommodate film up to and including 14 x 18 in. in size and permits the use of a variety of camera backs. Standard equipment includes: cut film back, automatic reset timer, solenoid shutter, Wollensak wide field lens, diaphragm control, stainless steel focusing tapes, 23 x 26 in. pressure type copy board with target board, and six 300-watt exposing lights. The camera is made of heavy gauge sheet metal and aluminum castings.

**Gevaert Offset Plate 115**

**An aluminum printing plate that can be prepared in less than one minute** for offset duplication of optically reduced or enlarged images was recently announced by the Gevaert Company of America, Inc. The new plate, known as the Gevacopy Rapid Aluminum Offset Plate will be available in sizes 10 x 16, 10 x 15⅜ and 10 x 15 in. Price will be 59¢ each. (Additional information is included in the Reproduction and Graphic Arts column on page 60.)


NEW! Lisco REGAL 4x5 CUT FILM HOLDER

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Made of Rugged, Durable RHINO-LITE Will not crack, split, or break!

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See your local camera dealer or write for free literature.

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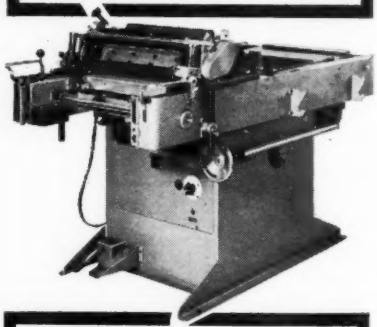

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Get more information. Circle 402, page 79

**Super Hypan Package** **110**
**Ansco's professional pack 120 recently announced is 100 rolls of same emulsion** Super Hypan film, foil wrapped, only packed in an intermediate container. The intermediate is inserted into a sturdy rigid cardboard shipping container. Data is included with each package and the film has each frame edge numbered. Price: $60.

## HOSPITAL TALE

(*continued from page* 59)

Only the best pictures are kept. The file consists only of PR pictures, all in one place and easily accessible. There are enough good pictures to meet a variety of PR requirements. For example, a newspapers' request for photos could be filled within minutes. This combination of good pictures and ready availability results in more photographs being used, each picture giving maximum service to Johns Hopkins.

Thompson has access to other cameras, such as Graphics and 35mm models. A set of air views was made with a Graphic. An operating room sequence might require a Robot.

Film is processed in D-76 and printed on two sets of contacts for filing. Enlargements are made as needed on an Omego B-8 using Varigam paper. Color is less than 10 per cent of the work, being used mostly for slide presentations.

There are limits to the photographic assignments attempted by the PR section. There is no portrait file because of the large number of people who would qualify for such a file. PR does no medical scientific work, leaving that field to the School of Medicine photographers. When they need such a picture, public relations goes to the medical photographers.

Thompson's advice to hospitals who have not yet discovered the use of photography is to get the best work it can afford. Get professional results with a professional if you can. If there is no real budget, get a qualified amateur. If you are the photographer, get a guide from the hospital staff to lead you through the "real" hospital. Then sell, trade or give your pictures to the hospital administrator.

Business and industry have long ago learned the value of good photographs in their public and community relations programs. So too have colleges and universities. Now it seems likely that the 7000 hospitals in the United States will discover how effective pictures can be in their quest for public support.—THE END


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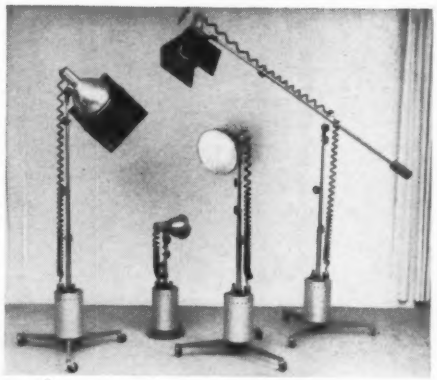

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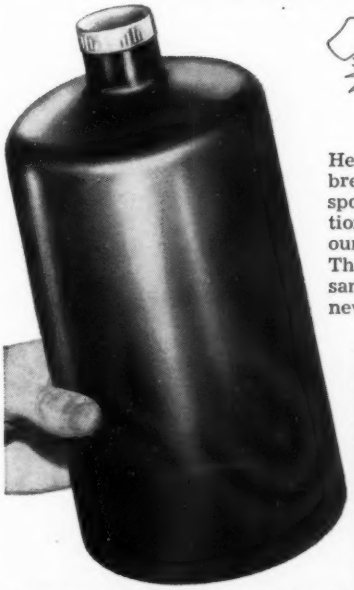

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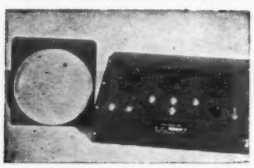

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**SIKORSKY**

(*continued from page* 53)

cut, which is the normal run for most engineering drawings.

The smaller drawings, 22 x 34 in. and 17 x 22 in. are burned-in on Columbia Colitho Number 6000 negative acetate plates. These are used because no development is required. The drawings, reduced to 11 x 17 in. or 8½ x 11 in. are run on the new Banthin Lithomatic press. As many as 50 copies each of 180 plates have been run on this press in a single day. The smallest of all drawings, 11 x 17 in., are run full scale. No negative is made—instead the original drawing is exposed to an Ozalith sensitized positive plate and placed directly on the press.

The darkroom set-up at Sikorsky is simple and a rigid routine is followed to the letter. "This" says Blankley, "leaves as little left to chance as possible when working with untrained personnel." Accordingly, two 25-gal. stainless steel tanks, with a motor driven mixer, were installed. A 50-gal. batch of A & B solution is used weekly. A specially made Leedal temperature-controlled sink holds three 40 x 50-in. trays. These trays rest on the dimpled bottom of the sink and have water pumped around them constantly. The water is held to 68° + ½° by heating coils and a refrigerating unit.

The techniques and innovations which Blankley has introduced do not lie solely with the size reduction of engineering drawings. New methods and ideas utilizing camera and press are tried out daily. Here are a few examples:

Formerly, all decals for installation on the aircraft were made on 3-M's Scotchcal material by the silk screen process. With the exeption of short-run multi-colored jobs, which would require changing ink, all decals are now made on the same material by offset.

Name plates for shipping containers and major assemblies had been engraved, painted black and the engraved area filled-in with white paint. These same name plates are now chemically etched. A negative or reversal foil, depending on whether black on white or white on black is desired, is made and exposed on the pre-sensitized aluminum. The aluminum is then developed for a total of 3 min., etched in 10 per cent caustic soda for about 1 min. and the name plate is complete. At first the aluminum was purchased already pre-sensitized but recently good results are being obtained with Kodak Photo Resist. Temporarily an old

drafting stool serves as a whirler for applying the resist, but the training department is now constructing a whirler capable of taking a 36 x 36-in. sheet of metal stock.

All Mylar loft-type drawings were formerly sent to an outside vendor for reproduction on metal. This involved shipping containers, shipping documents, freight charges and personnel to handle them. Now the whole job is an in-plant operation. Anodized, unsealed aluminum stock is coated with diazo solution in a Dietzgen roller coater. The original loft drawing is imprinted on this sensitized plate in a 5 x 12-ft. Brown vacuum frame. The plate is developed on a Sikorsky-designed rack with cotton wads soaked in solution. The whole job is complete in one-half hour. In addition, translucent copies are made in the same frame using pre-sensitized mylar. Steel or wood painted with an iron-free paint may also be coated in the same coater. Many one-shot tools on wood have been made this way and experiments are being conducted with magnesium as a base for this coating process.

In addition to these processes, Sikorsky uses a Headliner and a Photo Copy Box. One man handles a microfilm operation centered around a Diebold Flow Camera and Processor and an Ozalid Microline Camera. Another task is the preparation of complete presentations on transparent flip charts for use in overhead projectors.

In the short time of its operation, the expanded reproduction group has paid off handsomely in production and in economy. In the first five months of 1959 the number of prints made exceeded any previous annual total. Based on the costs per drawing in the new and the old system, the savings during this five-month period amounted to a cool $271,000. The two main factors in this economy are these: a two-times reduction in size decreases paper consumption by 75 per cent; and, because most prints are made on bond paper instead of sensitized sheets, the cost per sq. in. is significantly decreased.—THE END

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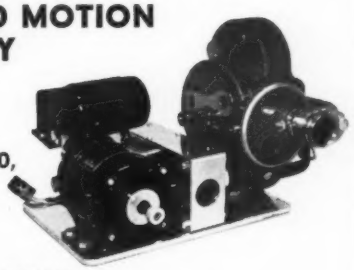

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Get more information. Circle 507, page 79


**3,750,000**

(*continued from page* 41)

First of all, we have learned that almost fantastic cleanliness is required since a ⅛-in. piece of lint on the aperture card film prints out as a 2½-in. piece of rope on the finished print—and a 1/100-in. speck of dust prints out as a 1/5-in. blockout which might obliterate essential information. In anticipation of this, our original plans for the reproduction area provided for a Precipitron®, an electrostatic air cleaning device which is so efficient that it even removes the particles that cause smoke to be visible. Because of the electrostatic attractive powers of the acetate-base film, it appears desirable that an aperture card cleaner be installed in the head of the printing equipment. We understand this is now being considered. In the meantime, we are replacing our manual card cleaner with an automatic-feed cleaner.

It has been said that the microfilm industry has more than its share of inconsistencies and contradictions. We feel that microfilm background density is another to be added to the list. Government microfilm specifications require background densities of 1.0 to 1.3. We found, however, that in the case of poor quality originals—faint lines on dirty wrinkled backgrounds—standard procedures produced film densities of 1.0 to 1.2. When these were printed with similar density films of good tracings, the prints of the poor-quality originals had beautiful clean backgrounds but you could not read the lines. If we turned up the voltage on Copyflo® and ran them again, we got more background but lines that could be read. Since practical operation of the system requires a film file that will print out at a single machine setting, any adjustment has to be made in the filming portion of the system. We reasoned that a lowering of film density would simulate the effect of increased Copyflo® voltage; we tried it and it worked. We came up with film densities as low as .7 which printed compatibly with the 1.0 to 1.2 negatives of good originals. Because of the importance of printing compatibility, we feel that our working microfilm must deviate from government standards as long as our originals are not top quality.

Another lesson we learned was that back lighting is necessary if we hew to the line that anything that worked under the old system will not be redrawn for the new. Among the drawings that are trans-illuminated are reverse-reading transpar-

encies, tracings which included Stan-Pats® applied to the back, and poor quality originals. Under poor quality originals, we include originals of both wide contrast limits (heavy ink originals plus light pencil changes) and cut-in texture (pencil originals drawn with heavy pressure and too hard a pencil). With certain types of reverse reading reproducibles, we get our best results with transmitted light only. Even though we do not like the system idea of deviating from standards, we feel that a certain amount of camera operator judgment is necessary for optimum results when the full range of available drafting-aids and tracing reproductions is encountered.

A recent improvement in our camera technique is so simple that I hesitate to mention it—but as far as I know there is no other firm in industry that is using it. I explained why we had to have backlighting for the wide range of originals encountered; the innovation is to mask the transmitting area around the tracing when it is on the backlighted copyboard—to reduce the extraneous light that hits the camera lens. It is as simple as shading your home camera from the sun, and the results are just as amazing. It works especially well on those tracings where heavy and light lines are intermixed; the light lines are emphasized without filling in the heavy lines.

Finally, let me suggest that printing ramifications be given the serious consideration they deserve when setting up an automated drawing processing system. Paper size changes take machine time and machine time costs money. Paper sizes, then, should be held to a minimum consistent with good paper management and machine batch sizes. We at Westinghouse find that we need only two sizes. Similarly, printing the short dimension of the tracing horizontally saves machine time and should be done whenever this is compatible with the minimum paper size requirements. Above all, be sure that all drawings of any size category are filmed in the same horizontal-vertical relationship. When drawing sizes differ slightly within the same category (i.e., 8½ x 11 to 9 x 12 in.), we feel that consideration should be given to varying camera reductions to produce printed images of equal size. This permits tighter machine-scan settings with accompanying higher machine utilization ratios, elimination of auxiliary paper trimming, and a finished, consistent appearance when prints are bound together in a package for the cus-

(*continued on page* 88)


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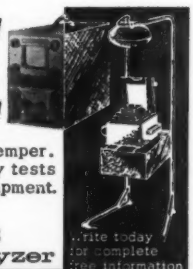

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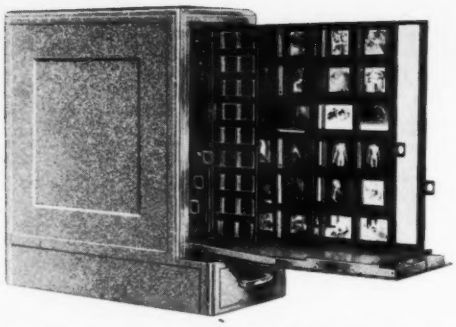

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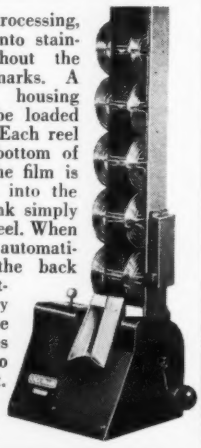

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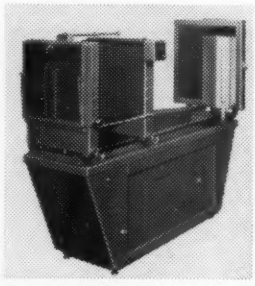

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**3,750,000**

(*continued from page 87*)

tomer. Because of the general acceptance of 8½ x 11 in. paperwork and related filing equipment, we at Westinghouse have selected camera ratios to produce finished prints that are 8½ x 11 in., or multiples thereof. Hand-trimming is avoided while mechanized folding, at only three machine settings, is facilitated; the mass-produced package appears custom-made.

I have described a rather large installation in this article; this does not mean that the system is for large organizations only. Actually, the costs and hardware vary proportionately with the system requirements and the small operator can compete with the large by utilizing different equipment at lower cost.

These results have not been achieved without some sweat and cusswords. We have experienced our full share of adversity and resistance to change. But we've won the battles and we've won the war. We're still in the conversion stage of getting all active tracings into aperture card form but no one challenges the system anymore.—THE END

## DIMENSIONAL STABILITY

(*continued from page 45*)

The following information came too late for inclusion into the chart on page 45. Listed below are pertinent details of Di-Noc film. DI-NOC CHEMICAL ARTS, INC., 1700 London Road, Cleveland, Ohio.

*Dinoflex Contact Films:* Silver halide coating on .007-.008 in. polyester base giving black image. Thermal coefficient, 1.2 x $10^{-5}$ in/in/°F; Linear expansion with 10 per cent increase in R.H., .00014 in/in. Cost/sq. inch: $.00421. Transparent matte material. Also available on .004-.005 in. polyester base; thermal coefficient, 1.4 x $10^{-5}$ in/in/°F. Linear expansion, .00016 in/in with 10 per cent increase in R. H. Cost/sq. in. 0.00375. *Dinoline Ortho* and *Dinolith Ortho Polystryene:* Silver halide coating on polystyrene, .005-.006 in. Black image. Thermal coefficient, 3.4 x $10^{-5}$ in/in/°F. Linear expansion with 10 per cent increase in R. H., .000095 in/in. Cost/sq. in., $.00228 ! Dinoline, $.00258 for Dinolith.

*Dinographic PN Contact* and *Dinographic Contact Matte:* Silver halide on polystryene base. .010-.011 in. thick giving black image. Thermal coefficient 3.0 x $10^{-5}$ in/in/° F. Linear expansion, .000077 in/in. Cost per sq. in., $.00357 for Contact, $.00391 for Contact Matte.

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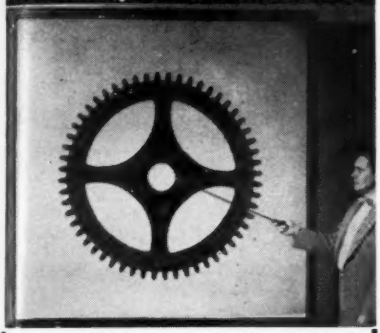

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(*continued from page 49*)

a studio. It was a great big barn of a place that I could never have afforded alone. We stayed there until she went to join *Life* and I stayed on since the magazine absorbed her share of the lease. I learned a great deal just from looking at her work and I still consider our association, even though we did not work together, as one of the best things that ever happened to me."

By the forties, with his salad days behind him, Richie became one of the leading industrial photographers, with such high-powered clients as Texaco, U.S. Steel, J. Ray McDermott, Gulf Oil, plus cover credits in *Fortune* and *Life*. His work is characterized by a consistently high level of both technical quality and pictorial appeal which are combined to present his client's story in the most favorable manner.

Travel continues to play a major part in the operations of Richie Productions, as Robert Yarnall Richie's organization is now called. His group consists of Frank H. Burns, V.P.—Sales; Rosemarie Dolch, secy.; Americo Calvo, whom Richie terms a "darkroom wizard" and Tom Maloney, photographer. Incidentally, both Calvo and Maloney handle assignments of their own.

Movie work constitutes an important phase of Richie's work, the result of a 16mm film diary kept during a *Fortune* assignment in South America covering Barco pipeline. The main purpose of the film was to show the home office in New York that conditions were as rugged as they had heard, with dangers not only from the tropical flora and fauna, but also from native head-hunters who would attack any unarmed person. The diary was edited and sound added, it prove so successful that the next year, 1941, the Texas Company asked him to make a film on seismograph and drilling in Texas and Louisiana.

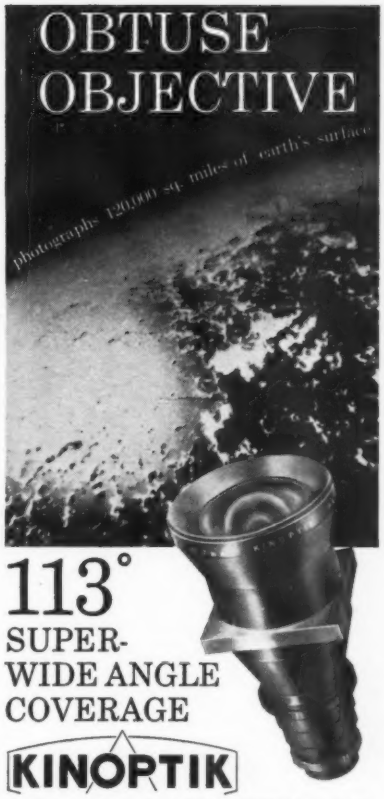
In 1946, 1947 and 1948, Richie filmed Saudi-Arabian oil operations for Aramco.

Since then, film assignments continued to come, accounting for 50 per cent of Richie's work during some years. Commercially, making a movie is a more efficient method of doing business, since more of a photographer's time is spent in productive work and less in the selling chores, a necessity for even the best people in the field.

In bidding for work, Richie can offer an expert knowledge not only

(*continued on page 90*)

OBTUSE OBJECTIVE

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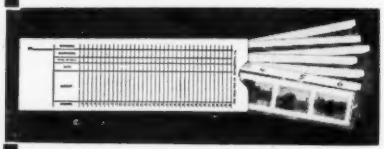

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**RICHIE**

(*continued from page* 89)

of photography but, perhaps more important, of American industry.

"We have a good working knowledge of where various plants are, of the geography of various industries, of where a desired picture can be made. Also, it is important to be able to work with people in industry, to get total strangers to cooperate with an outside photographer. This was important when taking pictures of GM's diesel locomotive shops where we had to get a locomotive turned around to get the desired composition. Speed of operation is another important aspect in this business. If you are taking a picture in an automobile plant, the cost to the company is not just your fee but the cost of cars not produced because the line stopped or because the cameraman took too long to get his pictures. This is why sometimes the cheapest photographer isn't always the most economical choice.

"One little point which many photographers dismiss as unimportant is giving prints to the people in your assignment. Apart from the political angle—a few prints to a shop foreman can make him a friend for life—it shows that you appreciate some of the effort the people went through to help you complete your assignment successfully."

The insistent ringing of the phones got more insistent, a not-too-subtle hint that for all of his eminence, Robert Yarnall Richie still had to make a living. It was time to leave.

As a parting shot, we asked about the "future." Richie replied that he felt "the trend to candid work is growing and that this will probably set the tone of most industrial photography for some time to come. This really represents a full cycle. When I started, people like Wolfe and Hoffman were doing excellent things with 35mm. Then came multiple flash during the forties and now we are back to candids.

"But," he continued, "it still requires a basic knowledge of good technique plus an understanding of industry to make a good industrial photographer, regardless of the type of picture produced. After all, fashions change and it may very well be that clients will want to go back to the more static but technically superior work such as was done during the forties."

It is most probable that regardless of the technique used or the type of picture wanted, the client's demands will continue to be satisfied by Robert Yarnall Richie.—THE END

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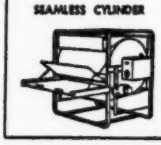

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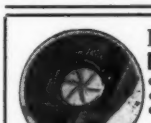

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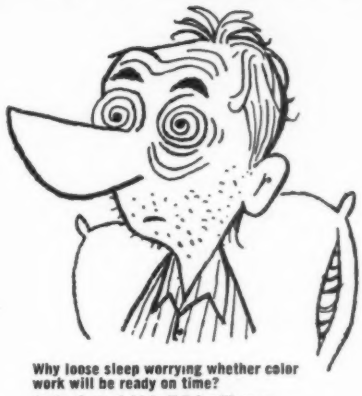

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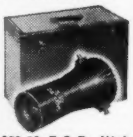

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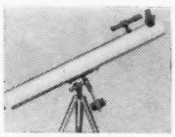

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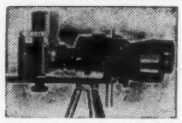

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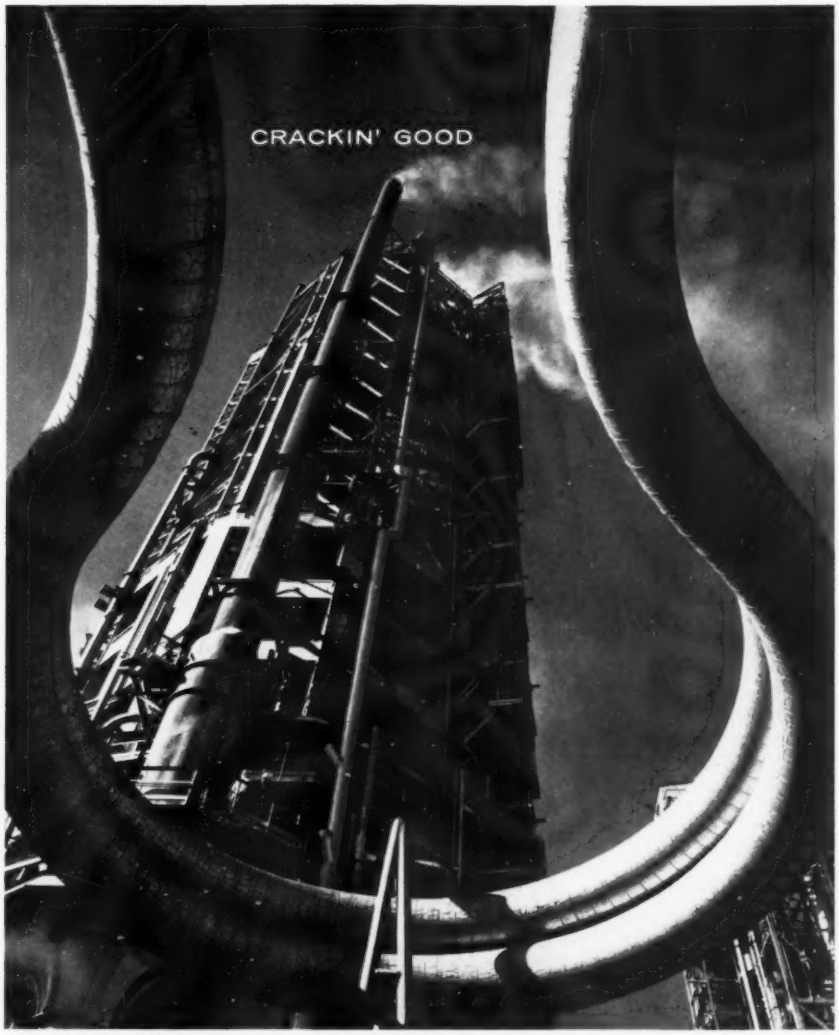


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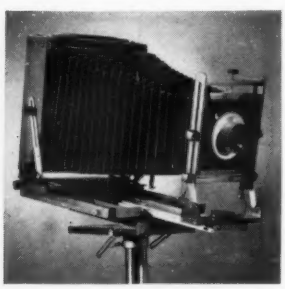

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